VOLUME 28 · NUMBER 7 · JULY 1945

AMERICAN JOURNAL OF OPHTHALMOLOGY

THIRD SERIES FOUNDED BY EDWARD JACKSON

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Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars. Published monthly by the George Banta Publishing Company, 450 Ahnaip Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company. Subscription and Editorial Office: 837 Carew Tower, Cincinnati, Ohio. Entered as second class matter at the post office at Menasha, Wisconsin.

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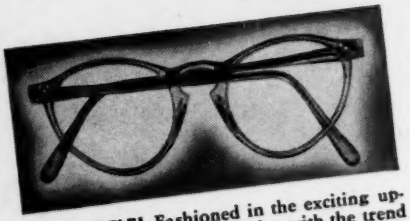

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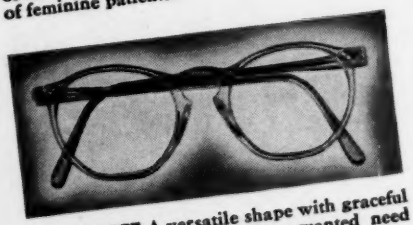

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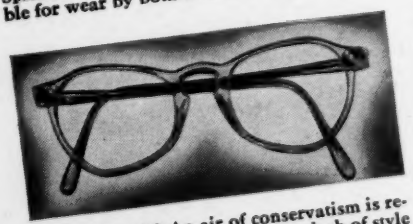

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 28 JULY, 1945 NUMBER 7

AN EVALUATION OF VISUAL-ACUITY SYMBOLS*

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Minneapolis, Minnesota

The testing of visual acuity is one of the most important procedures employed in an ophthalmologist's office. It is important not only because it is used so frequently, but also because many of his decisions depend upon its outcome.

Because of its importance, consideration should be given to its accuracy. A survey of the procedures for testing vision in common use today reveals that considerable inaccuracy is involved, and that the testing of vision is one of the most loosely conducted tests. The method employed is comparable to measuring distances with yard sticks of variable lengths. As compared with measurements used by scientists in other fields, it would be classed as an unscientific test, just a rough approximation. It is unfortunate that such a fundamental procedure should be so scientifically inexact. Such inexactness in other scientific fields would be held in contempt and promptly discarded.

Although we have developed instruments and methods of great precision in other phases of our work, we are still employing the visual-acuity methods advocated by Snellen[1] more than 80 years ago. A review of the literature on the subject reveals that the first fundamental contribution to the subject was made by Snellen in 1862, when he published his first "optotypes," constructed to subtend an angle of five minutes. To him belongs the credit of having introduced characters arranged on a definite scale. Following the work of Snellen, various contributions to the subject were made, the most significant of which were those of Landolt and Ewing. In 1888, Landolt introduced the broken-circle test; in 1902, Ewing[2] contributed a chart that was an improvement over those employed previously.

In 1909 the broken-circle of Landolt was adopted as the standard international test object, by which all other test objects were to be graded. In 1916, the Ophthalmic Section of the American Medical Association[3] approved the selection of certain characters as standard. In 1919, Evans[4] brought out a chart in which the characters had a body structure based on the Landolt circle. In 1925, the National Society for the Prevention of Blindness adopted the Snellen "E" as the preferred method for testing the vision of children.

At intervals since this time various efforts have been made to increase the efficiency of the test charts. The significant recent contributions are the works of Cowan, Berens, and Verhoeff. In 1928, Cowan[5] constructed a chart in which the letters selected conformed more accurately to the physiologic requirements of the standard test object. In 1937, Berens[6] presented a chart with figures in colors designed for the testing of illiterates and children. In 1938, Verhoeff[7] presented an original idea in a chart consisting of circles of varied sizes. When we consider

* Thesis (condensed) submitted for membership in the American Ophthalmological Society, 1944.

the importance of visual acuity in ophthalmology, and the comparatively small amount of research that has been done on it as compared with other phases of our specialty, it suggests that the subject justifies more serious consideration.

There is a tendency on the part of many ophthalmologists to consider the visual-acuity problem from only the eye specialist's standpoint, and to lose sight of the fact that it is a problem involving practically all phases of medicine. The entire field of medicine looks to us for leadership, and the attitude assumed by it is dependent upon ours. Consequently, when there exists a diversity of opinion among ophthalmologists as to the reliability and proper method of giving the visual test, it is not surprising that this lack of a definite policy has resulted in indifference toward the test on the part of the general physicians, pediatricians, welfare workers, and the school nurses. It is important to remember that these people come in contact with prospective patients long before the eye physician is consulted. An indifferent attitude toward the testing of visual acuity is to be deplored, and the test should be popularized to the fullest degree.

It should be emphasized in all fields of the profession how fundamental the testing of vision is, especially in that of preventive medicine, for visual-acuity checks lead to the early recognition of defective eyes. That more frequent routine visual checks are necessary is evident, if we can depend upon statistics. It has been stated that 1 in 25 children has his visual acuity tested. In a public health report which gives the results of testing 9,245 children, it was found that 40 percent of those tested did not measure up to the normal standard. It is apparent that only a small percentage of the people have their visual acuity tested and that many important ocular problems are being overlooked. This is especially true in the case of children, wherein early precautions will prevent many unnecessary eye problems. If a standardized method existed, and if the importance of the visual-acuity tests were sufficiently emphasized, much permanent ocular damage could be prevented. It is, therefore, the problem of the ophthalmologist to emphasize to the other medical workers the importance of visual-acuity testing, but in so doing we must recommend a method that is not only efficient in the time involved but also in its accuracy. It behooves us as ophthalmologists to keep in mind the fact that we are looked to for guidance in this important phase of medicine, and our attitude toward it can determine the attitude of the profession as a whole.

If we assume the responsibility of advising others correctly as to this procedure, we must, in fairness, do our utmost to present a scientifically exact method. The first step in this direction calls for a definite knowledge of the reliability of our present methods as a scientific test. However, in analyzing the situation, most of us will agree that the visual-acuity test as used today is inaccurate, and that most of the inaccuracy of the test rests with the symbols used.

It seems obvious, therefore, that visual-acuity examinations will achieve greater accuracy if the symbol is improved. It should be standardized like other procedures in ophthalmology, so that the same symbol and technique are used in all offices instead of the great variety in use today. Granting the importance of surrounding conditions such as illumination, distance, and like factors, it must be conceded that great possibility of inaccuracy rests with the symbol.

The purpose of this presentation is, therefore, an attempt to clarify the situation by evaluating the various symbols in common use today.

Procedure

In approaching the problem, it must first be recognized that the testing of visual acuity and of refraction calls for different types of symbols. Instead of attempting to use the same symbol for both procedures, thereby sacrificing efficiency, a symbol should be constructed for the specific purpose of testing vision. In addition, this symbol, although following certain fundamental principles, should be varied according to the age of the patient. It is evident, for example, that the judgment of a child under six years of age is not equal to that of an older person. Not only the symbol but also the technique must be altered in accordance with the age of the subject.

It is apparent that the various symbols now being used to test vision may be classified into two groups. The first comprises those symbols which use the Landolt broken circle as a basis; the second group, those using letters of the alphabet or numerals as a basis. The popular symbols used today are of the second group, in spite of the fact that the ophthalmic section of the American Medical Association in 1916 adopted the Landolt circle as the accepted symbol.

To evaluate the various symbols properly the requisites for an ideal test symbol should be borne in mind; namely, 1. The test should be standardized so that the results obtained will be uniform. The 1- to 5-minute requirements of the Snellen scale are considered standard. The 5-minute requirement refers to the overall size of the letter and the 1-minute requirement to the size of detail that has to be discriminated. 2. The target should be accurately constructed as to size, color, background, and should have the proper illumination. 3. The target should be understandable—a simple task of judgment. 4. The target should be interesting to the patient. 5. Targets of the same size should not vary in visibility. 6. The target cannot be memorized. 7. It should be possible to test at will any meridian desired. 8. The judgment required should be in terms of acuity and not of recognition. 9. It should be used only for testing the vision, not also the refraction. 10. The test should not produce fatigue. 11. There should be sufficient divisions and equality of steps throughout the scale. 12. The test should be adjustable to different ages. 13. Changing the accommodation from distance to near objects should be unnecessary. 14. It should not be necessary to learn the names of the target. 15. Targets should not be too close together.

Method of procedure

The investigation, which consisted of an evaluation of various symbols, is divided into two parts:

Part A consists of the various methods in use today.

Part B consists of methods as suggested by the author.

Part A

The symbols selected were classified into four groups, based upon age, for age is, as a rule, indicative of the ability possessed by an individual to analyze the various symbols.

Group I consisted of symbols understandable to patients 11 years of age and older; group II, of symbols understandable to patients 7 to 11 years of age; group III, of symbols understandable to patients 5 to 7 years of age; and group IV, of symbols understandable to patients 3 to 5 years of age.

For each group, 25 patients were selected, and an effort was made to have the selection of these patients based on at least an average degree of intelligence and coöperative attitude. This seems to be essential in order to attain a higher degree of accuracy. A small group of this type of

patient would serve better to evaluate the symbols accurately than would a large group of patients varying in intelligence and coöperation. Because of the small number of patients, nothing conclusive is possible, and the findings can be considered only suggestive.

The symbols were exposed at 20 feet from the patient, and one eye at a time was tested. The illumination used was 15 foot candles. All effort was made to have other conditions as conducive as possible to the obtaining of accurate results.

Each individual of the first three groups was tested three times at 5-minute intervals. In the fourth group each patient was tested but once for each chart because of the difficulty encountered in maintaining sufficient concentration.

In selecting charts for comparison, it was considered impractical to compare all the charts on the market. The charts selected for comparison were those that served to illustrate certain individual principles, or that could be considered representative of a group of charts. In this way, much repetition was avoided.

In the first series, which consisted of patients 11 years and older, the following charts were used: 1. Standard Capital Letter chart with the A.M.A. ratings and published by Bausch and Lomb. 2. Cowan chart. 3. Verhoeff chart. 4. Landolt broken-circle chart. 5. Ferree-Rand chart.[8]

In the second group of patients, whose ages varied from 7 to 11 years, the following charts were compared: 1. Standard Capital Letter chart of Bausch and Lomb. 2. Cowan chart. 3. Landolt broken-circle chart. 4. Ferree-Rand chart. 5. Snellen "E" chart.

In the third group of patients, whose ages, varied from 5 to 7 years, the following charts were used: 1. Standard Capital Letter chart of Bausch and Lomb. 2. Waugh chart.[9] 3. Gardner chart. 4. Jackson incomplete-square chart.[10] 5. Snellen "E" chart. 6. Landolt broken-circle chart.

In the fourth group of patients, in which the ages varied from 3 to 5 years, the following charts were used: 1. Berens chart. 2. Evans chart. 3. Bailey-Peckham chart. 4. Beber chart. 5. American Optical Co. chart. 6. Ewing chart. 7. Seitz chart. 8. Cooperman chart. 9. Snellen "E" chart. 10. Landolt broken-circle chart.

Following the investigation of the various symbols under consideration, one is impressed by the fact that no one of them may be regarded as entirely satisfactory.

In considering the first group, it is apparent that the capital-letter type of symbol is unsuited for testing visual acuity.[11] The popularity of the capital-letter chart derives from the fact that it is better known and is considered the standard test for visual acuity in adults. In addition, it is readily understood by the patient and easily executed. Its popularity cannot be based upon its reliability of results, for the letters have a variable visual value. Because of their structure, the element of conjecture enters, and the visual acuity is overestimated. Inability to reproduce results is also a factor against its use.

The Cowan chart, although having certain noteworthy features, cannot be considered sufficiently superior to justify its adoption.

The Verhoeff chart has several unique features but, as found in this group, did not prove to be sufficiently practical to justify its adoption.

In comparing the Landolt circle having the single break with that having the double break, it appears that the double-break circle of the Ferree-Rand chart is the more practical.

The Landolt circle of Ferree and Rand seems therefore to be the symbol of choice for the first age group.

In the second group the Snellen "E" seemed to be superior to the Standard Capital Letter chart in ease of performance and recognition.

When the Snellen "E" is compared with the Landolt circle with the double break, it is clear that in symbols of the same size the value of the visual reading does not correspond. The "E" gave better visual readings and the element of conjecture entered very strongly. The broken-circle symbol was more consistent in reproducing results and conformed more closely to the recognized standards. It was, however, more difficult to understand for this group than was the Snellen "E." It seems possible that if more publicity were given the double broken circle it would be as well accepted as is the "E" symbol.

In the third group, the Waugh, Gardener, and Jackson symbols were considered. These symbols did not offer any noteworthy advantage as compared with the other symbols. In the case of the Standard Capital Letter chart, the inaccuracies found in this younger group of patients were more in evidence than was the case in the two foregoing groups. The Snellen "E" chart was readily understood, but the previously mentioned inaccuracies were more in evidence.

The Landolt circle was more confusing and required more explaining than did the Snellen "E." The response when the Landolt broken circle was used was more consistent than was the case in the other methods.

In the fourth group the responses to the picture charts were not accurate when compared with the responses to the Snellen "E" and the group required more coaching. The Landolt broken circle did not prove to be so easily understood as was the "E" symbol, but where it could be used, it gave more consistent results.

After considering all the evidence as found in this analysis, one is led to conclude that in the various groups examined the Landolt circle with the double break is the most accurate symbol. Although somewhat more difficult for the patient to understand than are some of the less accurate charts, this factor should not cause it to be replaced.

A comparison of results, however, does not show in a convincing way that the ultimate in visual-acuity symbols has been attained.

Part B

In this section, a series of symbols is presented which consist of modifications of various methods in present-day use.

The following modifications in the type of symbol are made because they offer another approach to the problem. The suggestions are purely experimental and await more extensive confirmation before they can be considered as an improvement over symbols in present-day use. Various suggestions are also made concerning the technique of presenting the tests.

It is, therefore, with the hope of eliminating some of the objections to the present-day symbols, and with the object of making a symbol which is designed specifically and wholly to test visual acuity, that the following suggestions are presented and in the following sequence: 1. Circular "E" chart. 2. Circular Landolt broken-circle chart. 3. Landolt broken-circle chart with a variable number of breaks. 4. Modified pictograph chart. 5. Modified Sjögren hand chart.

Circular E chart

The first suggestion has to do with the deviation from the usual technique of using the Snellen "E" chart.

According to the accepted technique, a chart is used upon which is printed the symbol "E" in various sizes and positions. The symbol is usually pointed either up,

down, or to one or the other horizontal positions. The first row has one symbol, the second has two, and so forth.

Technique of using the Circular "E" chart

Test Object: The symbol "E" is printed on both sides of a circular piece of white

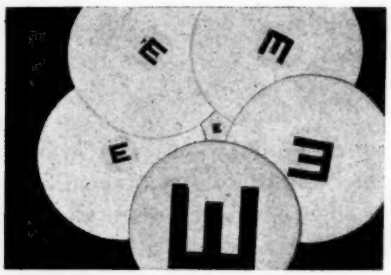

Fig. 1 (Fink). Circular "E" chart.

reflex-free cardboard which is six inches in diameter. A greater number of gradations in the size of the symbol is employed than in the standard chart (fig. 1).

Method: The circle is held in front of a plain surface where the illumination is uniform. The patient indicates with his hand the position of the symbol. The shifting of position is not seen by the patient. The smallest symbol correctly seen indicates the visual acuity of the eye being examined.

Comments: This method has certain advantages over the usual Snellen "E" chart: By having a greater variation in the size of the symbol, a more accurate estimation of the vision is possible. The test can be made more rapidly than is possible with the other method and numerous exposures can be presented. This gives a truer estimation of the visual capacity of the eye.

The circular chart is more flexible. Whereas the fixed symbols on the chart are usually horizontal or vertical, the circular chart can be placed in any position desired, thus making possible the oblique in addition to the vertical and horizontal positions.

It is more understandable and more attractive to the child because it can be explained by placing the card in his hands. It is less distracting to the child because the chart is simpler than the standard "E" chart.

The vision of the child can be checked at home periodically by giving the parents a symbol.

CIRCULAR BROKEN-RING CHART WITH THREE BREAKS

The symbol is placed on a circular piece of cardboard as previously described. The ring conforms to the Snellen specifications and has three breaks, with intervals of one minute between the breaks (fig. 2). The patient indicates with his fingers the direction of the breaks.

Comments: It fulfills most of the requirements for an efficient method. It is flexible, and numerous variations in positions are possible. It can be made in finely graduated steps so that an exact threshold of vision is obtained. It is simple to understand. It cannot be learned. It checks the

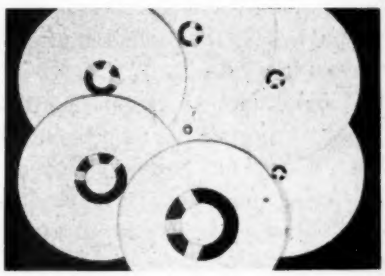

Fig. 2 (Fink). Circular broken-ring chart with three breaks.

various meridians for astigmatism. It can be used for patients of all ages.

MODIFIED LANDOLT CIRCLE WITH A VARIABLE NUMBER OF BREAKS

The chart consists of a series of Landolt circles in 17 graduated sizes con-

structed so that there is a more equal variation in the size of the target, thus avoiding large visual steps (fig. 3).

The chart is designed on the principle of recognizing the number of openings in the circle rather than the position of one or two openings as is customarily done. The targets have 1-minute breaks which vary in number in each circle. A circle may have two, three, or four breaks. The sequence is varied so that it cannot be memorized readily. Each circle is sufficiently separate from the next, and confusion resulting from over-crowding is thus avoided.

Technique: In examining an older child or adult, the patient indicates the number of openings in each symbol as he reads across the line.

The test, although suited to older children and adults, can be used effectively for children as young as five years of age.

In examining a young child, it is necessary to give him some preliminary instruction at close range. He is shown a complete circle. The examiner clips small pieces of paper on the black circle and the child indicates the number of small white pieces by raising his fingers. After the child is familiar with what is wanted, the examiner, at a distance of 20 feet, using a window card, exposes one symbol at a time. The smallest line or symbols the child can recognize are an index of the vision.

The method of using this target can be varied, depending upon the mental development of the child.

Comments: The chart is designed for testing visual acuity only.

It permits a more scientifically exact estimation of vision than does the Standard Capital Letter or Snellen "E" chart. It conforms to the accepted standard. It has all the advantages of the Landolt circle with the additional advantage of testing more than one meridian at one time, thus avoiding repetition and fatigue. It has none of the disadvantages of the "E" chart. It analyzes both the image-forming function (Snellen letters) and the detail discrimination (Landolt circle). It is easier to understand and report than is the Landolt circle, because designating the number of openings by number is much more certain, even with a child,

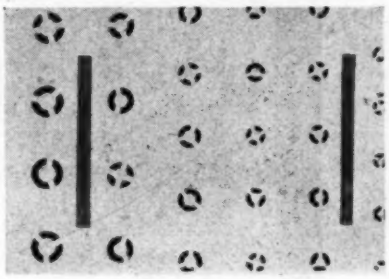

Fig. 3 (Fink). Modified Landolt circle with a variable number of breaks.

than indicating the position of one or two openings as is necessary in using the other Landolt symbols. Results are reproducible. It is unlearnable. There are two rows of symbols for the last three gradations. One line is used for each eye thus eliminating memorizing.

Modified pictograph method

Due to the fact that a very young child does not understand the Landolt or Snellen "E" type of chart, it may be advisable to use a picture in testing the vision.

The modified picture method is proposed because it has certain advantages over other targets of this type, the two chief advantages being the method of presentation, and the comparatively close adherence to the Snellen specification (fig. 4).

Description: Nine targets make up the set and are employed in the same manner as are flash cards. Each picture is made in seven sizes.

The pictures conform more accurately to the standard requirements than do other methods of this type.

Technique: The test is presented as a game, and the child must be unconscious of the fact that his vision is being tested.

Nine pictures are placed before him. The examiner, standing near him, exposes a picture and the child selects a similar picture from a group placed in front of him. After the method is understood, the cards are exposed at 20 feet. The smallest pictures recognized are an index of the vision.

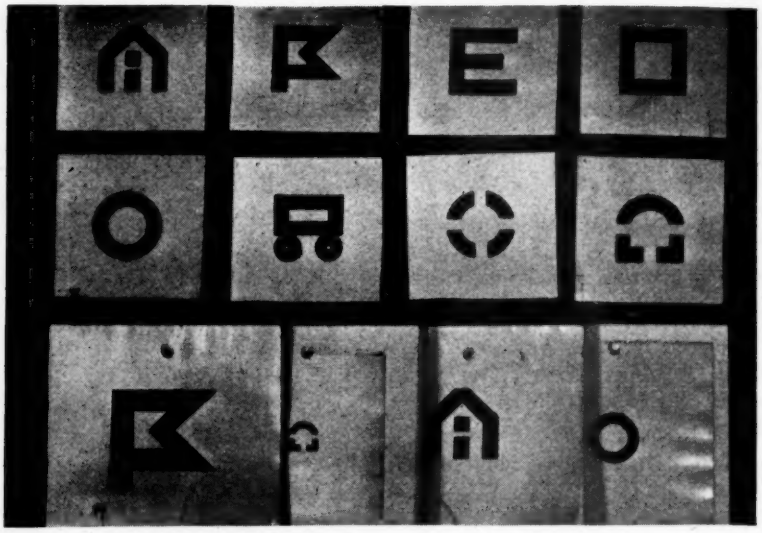

Fig. 4 (Fink). Modified pictograph method.

Fig. 5 (Fink). Modified Sjögren hand chart.

Comments: The method is more easily understood than is the Bailey method and

more flexible. It is more accurate than are other pictograph charts. It can be carried out by a nurse. It will give a fairly accurate idea of the visual acuity in a very young child, when the other methods fail to interest him. To the child, the test is a game and arouses interest and coöperation. To note improvement in visual acuity in amblyopic eyes such a test will give concrete information. It can be repeated without becoming monotonous. It is a test to be used for the very young child where an approximate idea of vision is wanted quickly.

Modified Sjögren hand chart

The symbol, in graduated sizes, is a picture of a solid black hand, printed on a circular card (fig. 5). The technique of using it is similar to that employed with the other circular cards.

Comments: The child understands this chart and requires very little preliminary training. The test does not conform to the standards. It can be used as a preliminary test to obtain an approximate idea of the vision. It can be used to arouse his interest before a more exact method is used, and has proved very practical.

Other circular charts

Various figures such as Mickey-Mouse, elephants, and others, may be used on the circular charts (fig. 6). Like the "hand chart," they are an approximate comparison of vision and can be used to advantage with the child when other methods have failed to interest him.

In summarizing the results obtained in comparing the Standard Capital Letter chart with the Landolt modifications, it is suggestive, judging from the results found in a small group of cases, that the visual-acuity readings are not comparable. It was definitely more difficult to read the Landolt symbol than the Capital Letter symbol for any given line. This difference in vision averaged one line in most cases. In addition, the reading for the line was more consistent when the Landolt symbol was used.

In comparing the double-break with the variable-break symbol it was clear that the variable-break symbol was more easily understood and it seemed to indicate the presence of an astigmatic error more definitely.

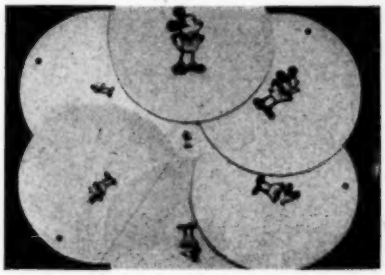

Fig. 6 (Fink). Pictograph method.

A comparison of the symbol "E" with the triple-break circle seemed to indicate that the triple-break-circle symbol was as easily understood as was the Snellen "E" and more exact in results.

The circle with the variable number of breaks was understandable also to the younger group.

Conclusion

Modern science rests upon the foundation of exact measurements. To persist in measuring visual acuity by a variable standard tends to lessen the accuracy of the work done and leads to erroneous conclusions.

Not only has there been no substantial change in the principles, test materials, and procedure of making the test since the days of Snellen, but even the principles laid down by him are not complied with in a great part of the testing that is now being done. Other phases of ophthalmology have made great advances since the time of Snellen. As stated by Ferree

and Rand[12] "It seems strange that a measuring scale which was established many years ago, when so little was known about acuity, should have remained so long with so little improvement." Our knowledge has advanced sufficiently in these matters to justify a revision in our methods.

In evaluating the various symbols now in use, it must be admitted that no one of them fulfills all the specified requirements of a perfect symbol. But before discarding them, an alternative should be offered—a practical one. Although a symbol may be scientifically correct, it may not prove to be popular because of the patient's difficulty in understanding it, and this makes a test time-consuming.

A satisfactory symbol must not only be accurately constructed but readily understandable, so that it will be efficient also from the standpoint of the time required for its use.

It seems evident that capital letters are not the best symbols for testing visual acuity. For this purpose they are entirely too variable. Not until the unfitness of letters for testing visual acuity is appreciated, shall we have visual-acuity records that are satisfactory. However, it must be admitted that in spite of the inaccuracies involved in using letters, they have certain desirable features; namely letters are understanding to the patient who can read, and the test requires very little time.

The Snellen "E," although adaptable to children and easy to use, is inaccurate and should be discarded.

The Landolt circle with either one or two breaks, although fulfilling many requirements, is not entirely practical. In many instances it is confusing to the patient; for not only does he not understand what is expected, but he has difficulty in reporting his observations.

However, taking everything into consideration, the double broken circle of Ferree-Rand seems the most practical of all symbols now in use for patients who are over seven years of age, whereas the symbol "E" appears to be more practical for younger children.

The problem is, therefore, to develop a test chart and test method that will give accuracy, precision, and reproducible results. The requirements are aptly stated by Ferree and Rand[12] as follows: "Obviously, if ratings are to be made and norms established, the task would be greatly facilitated by adopting a single test object of suitable form or type. To do this, it is necessary to construct a scale, the divisions of which would set tasks for the eye's powers of discrimination. For such a scale, there should be a selection of a suitable type of test object properly graded and distributed as to size, a standard color, and intensity of illumination, standard coefficients of reflection of object and background, and a standard coefficient of gloss or finish for the cardboard or other background on which the test objects are presented."

In the hope of fulfilling some of these specifications, the author has submitted for more extensive study, the various modifications previously enumerated. After using these methods for several years, he is convinced that the suggestions have possibilities.

The Landolt-circle symbol with the variable number of breaks should be considered as a method for testing patients who are seven years of age and older. It fulfills most of the requirements of a perfect symbol because it has the following advantages: It is constructed to the exact Snellen specifications. The results obtained are uniform and reproducible. It offers a simple task for the judgment; simpler than the other Landolt type of symbols. It is interesting to the patient. The symbols are of the same size and do not vary in visibility. They cannot

be memorized. They test the various meridians readily. The judgment is in terms of acuity and not of recognition.

The symbol is designed for testing acuity only, not refraction. It does not produce fatigue. There are sufficient divisions and equality of steps throughout the scale. It is adjustable to different ages. It is not necessary to learn the names of the targets as they are indicated only by numbers.

In the case of patients under seven years of age, the triple-break Landolt circle should replace the Snellen "E" because it is more accurately constructed and is as easily understood.

For very young children, the modified pictorial chart has possibilities.

For the indifferent child whose interest cannot be aroused, the Sjögren hand chart or other modifications, such as Mickey Mouse, may be of value in obtaining some measure of coöperation or at least some idea of the visual acuity.

In spite of analysis, experimental proofs, and the findings of committees, many examiners will continue to use what they are accustomed to. The force of many years of habit is strong and difficult to overcome. Unfortunately, because of lack of restriction and supervision, almost any type of test chart may be used with any type of technique.

Ophthalmologists as a group should decide upon a standard method of testing visual acuity, and publicize the importance of the test.

1029 Medical Arts Building (2).

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INFLUENCE OF SELECTED SPECTRAL DISTRIBUTION ON THE GLARE EFFECT, STUDIED BY MEANS OF DARK ADAPTATION*

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Due to the practical importance of the glare effect of artificial illumination in industry and traffic, a great number of investigations have been performed especially during the past 25 years. It is clear that only the interference of glare with definite visual functions can be exactly measured, although the sensation of discomfort should not be neglected in the appraisal of the light source. Both effects are not always parallel.[1] Various methods have been used to study the interference of glare with visual functions, such as the interference with visibility and its components, the visual angle, the brightness threshold and brightness contrast;[1,2,3,4] the brightness difference perception,[5] the measurements of the apparent angular diameter of the halos surrounding the retinal images of the glare sources;[6] the recovery of brightness difference perception[5] and of visibility;[4] the subjective brightness and fading of afterimages.[7] It is surprising to note that dark adaptation has been used very little for the comparative study of glare effects, although the threshold sensitivity to light appears to be a direct approach to this problem. This might be due to the fact that dark adaptation was first measured in 1903;[8] and a satisfactory method was not developed before 1921.[9] Nevertheless, there is ample experimental material to justify the use of this method for a comparative study of the glare effect. The adaptation curve affords several indices for analysis of the glare effect. With increasing brightness, the speed of dark adaptation slows down, and there is an alteration in the shape of the curve.[10,11,12,13] When one uses white light for the test patch (the results with colored lights will be discussed later), the dark-adaptation curve at first drops rapidly, and then slows down, so that a plateau is approached. This plateau is somewhat manifest and prolonged after exposure to a bright light. The plateau, indicating the final level of cone adaptation, is followed by a rapid drop, due to the first rapid part of rod adaptation. The transition point between cone and rod adaptation, which occurs between five and nine minutes of dark-adaptation time, is a sharp break after adaptation to bright light and an important criterion for visual function.[11,14] After exposure to dim light, the dark adaptation is more rapid, and no plateau or transition point occurs, so that cone and dark adaptation cannot be separated. With increasing brightness of the preceding light exposure, the separation between cone and dark adaptation becomes more manifest together with the prolongation of dark-adaptation time. Mandelbaum[14] explains the different shape of the curves with the assumption that regeneration of the visual purple may take place directly from retinene in a relatively rapid manner or by a slower route through vitamin A, and that the brightness of the adapting light may determine which of these reactions will predominate. We restricted our measurements to cone adaptation and the first part of the rod adaptation, so that the

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transition point could be determined. The restriction to cone adaptation appeared to be appropriate not only because of the practically much more important role of photopic vision but also because, according to Hecht, Haig, and Chase,[12] the range of rod dark adaptation remains unchanged with increasing brightness of light adaptation, although its appearance is more delayed with the level of light adaptation, "as if the rod curve as a whole were moved so as to appear later the higher the light adaptation."

In an earlier study,[16] the more rapid rise in the fusion frequency of flicker with increasing brightness of a new illuminant (lamp B, Verd-A-Ray) in which the radiation is reduced at both ends of the visible spectrum without appreciable reduction between 5,400 and 5,600 AU,* compared to usual frosted lamps (lamp A) was interpreted as possibly due to a lesser glare effect of lamp B. We thought it worthwhile to compare the glare effect of lamp B and lamp A by a more direct approach, using the dark adaptation.

Several studies have been made on the influence of more or less monochromatic light on the effect of glare. The reduction in visibility[6] due to glare is somewhat greater for sodium light than for tungsten light for angles less than 5 degrees between the glare source and the line of vision, probably due to the halos surrounding the source of glare.

No difference was observed for greater angles. No significant differences of the glare effect on visibility, determined by the threshold brightness of a circular test object for three different constant brightnesses of the background, could be seen when comparing tungsten light with moderately colored lights (canary, amber, light blue). However, in a modified visibility test (variation of the brightness of the glare source to determine threshold contrast visibility) the average candle power of an amber glare source could be about 14 per cent greater than that of white light.[17] Mandelbaum and Mintz's important results[15] will be considered in a later part of this paper.

Because of the present wide use of dark adaptation, individual and daily variability has been considered and analyzed in several recent papers[14,18,19,20] which will be considered in the discussion of the results.

Method

For our experiments we used Newton's[21] adaptometer. This instrument measures a visual threshold range from 10 to 0.05 millifoot candles (M.F.C.); that is, the total range of cone adaptation and the first (rapid) part of rod adaptation. The test patch of one-third degree of visual angle was 5 degrees above the small fixation point. The fixation point was illuminated with red light, the test patch with white light. In this instrument the color of the test patch does not change at different levels of illumination, because the illumination was varied by changing the reflecting angle of the light source onto the test patch. All experiments were performed from the same dark adaptation level of 0.05 M.F.C. No artificial pupils were used; according to Mandelbaum[14] the use of artificial pupils in normal subjects with normal pupillary reflexes does not produce any essential change of the dark adaptation except that artificial pupils tend to slow down some-

* Briefly, the spectral distribution of this illuminant may be characterized in percentage of incandescent frosted lamps at different wave lengths: complete absorption at 4,000 AU, 53-percent reduction at 4,200 AU, 30-percent reduction at 4,400 AU, 24-percent reduction at 4,600 AU, gradually diminishing to 6-percent at 5,000 AU and 3.5-percent at 5,200 AU; no appreciable reduction between 5,400 and 5,600 AU, and 3.5-percent reduction between 5,800 and 6,800 AU.

what its total duration. Mandelbaum presents data to calculate the dark-adaptation data for any standard size of artificial pupil from data obtained without artificial pupils. Since we compared the same subjects under otherwise equal conditions, such calculation did not appear to be essential for comparison.

The experiments were performed on three subjects after two months of preliminary training. For light adaptation, we used a wooden box with the bulb fixed centrally in the back opposite a plate of frosted glass (8 by 8 inches). The eyes of the observer were kept at constant distance from the illuminated glass plate. Two series of bulbs of different wattage were used [usual frosted lamp, Mazda (lamp A); and Verd-A-Ray bulbs (lamp B)]. Binocular presentation was used. Two series of experiments were performed; in series I, the lamps A and B were compared at the same distance of 6 inches from the illuminated glass plate. Four levels of brightness were obtained with 60-watt, 100-watt, 200-watt, and 300-watt lamps. For lamp A, 125, 200, 590, and 1,050 foot-candles were obtained as compared to 95, 175, 475, and 800 foot-candles with lamp B. It can be seen that the illumination level is about 25 percent lower with lamp B. In a second series of experiments, we compared the lamps B at the same brightness level as lamps A. For this purpose we shortened the distance between eye and illuminated glass plate for lamp B until the same brightness level was obtained as for lamp A. By this procedure, the visual angle of the illuminated area was enlarged. Since the visual angle was already large at 6-inch distance, and far exceeding that included by fixation point and test patch in the adaptometer, the magnification produced by the shorter distance does not materially effect the experimental results.

All investigators working with bright illumination levels have experienced difficulties in reading-threshold levels because of afterimages (Müller,[22] Mandelbaum[14]). Although afterimages are themselves a glare effect, they concern obviously different visual processes and may seriously interfere especially with the first reading after light exposure, naturally more so at the higher brightness levels. After some training, it is possible to recognize the test patch through the afterimages. Even so, the first reading is usually the least accurate (Hecht,[11] Mandelbaum[14]). The afterimages disappear more rapidly when the eyes remain closed between the readings. The intensity of afterimages was reduced by preëxposure with closed eyes for one minute at the two lower brightness levels (1 and 2) and for two minutes at the two higher brightness levels (3 and 4).

This procedure was advantageous also for another reason. The immediate change from complete darkness to a bright illumination with open eyes produced lacrimation and blepharospasm with a rapid blinking rate. Especially at the higher brightness levels, lacrimation and rapid blinking rate are an effective protective mechanism against glares, reducing considerably the actual exposure time. Luckiesh and Moss[23] have experimentally demonstrated the increase of the blinking rate with glare.

This procedure has theoretically the disadvantage that a certain amount of diffuse light penetrates the eyelids and produces a certain degree of light adaptation. During the preëxposure, however, the amount of light penetrating the eyelids is surprisingly small, even at higher brightness levels, as we found in an additional series of experiments.[24] In any case, the comparison between the two arrangements (lamp A and lamp B) is valid, since the experimental procedure was the same.

The same arrangement (brightness

levels) was compared with lamp A and lamp B on the same day. In subjects ES and SB only two experiments were made in one day. Therefore, the experiments with series I (equal distance, different brightness) and series II (equal brightness, different distance) were made on different days. With subject SS, whose adaptation time was much faster, both series were performed on the same day. There is unanimity of opinion that variations of dark adaptation, tested under otherwise equal conditions on the same day, are insignificant.[14,22] The experiments were repeated on different days with a different sequence of lamps; that is, when lamp A had been tested before lamp B in the preceding experiment, lamp B was taken first in the subsequent one. The average values were calculated from two to four different experiments, performed on different days, the number of experiments being determined by the magnitude of daily variations.

The first reading was the time when the threshold of 10 M.F.C. could be seen. Subsequently, a reading was taken each full minute from the end of the exposure. When the threshold dropped to a value between 0.3 and 0.1 M.F.C., more frequent readings were taken in order accurately to determine the time for recognition of the final value of 0.05 M.F.C.

In addition to these experiments, 32 normal subjects with normal or fully corrected vision were investigated. These subjects were not trained for dark adaptation, but most of them served as subjects in other visual tests (visual acuity, fusion frequency of flicker). Before the actual experiment, an experiment was made in order to familiarize the subject with the procedure. Lamps A and B were used at an equal brightness of 125 F.C. In half of the subjects lamp A was examined first, in the other half lamp B. The experiment was repeated after one to three weeks' interval, with an order of lamps reversed as used in the first experiment. Several subjects were investigated three times.

Results

Each dark-adaptation curve was plotted with log threshold as ordinates against the adaptation time as abscissae. From these curves, the dark-adaptation time at 10 M.F.C., at 1 M.F.C., and at 0.05 M.F.C. and at the transition point was determined. Figure 1 shows the average values of dark-adaptation time until

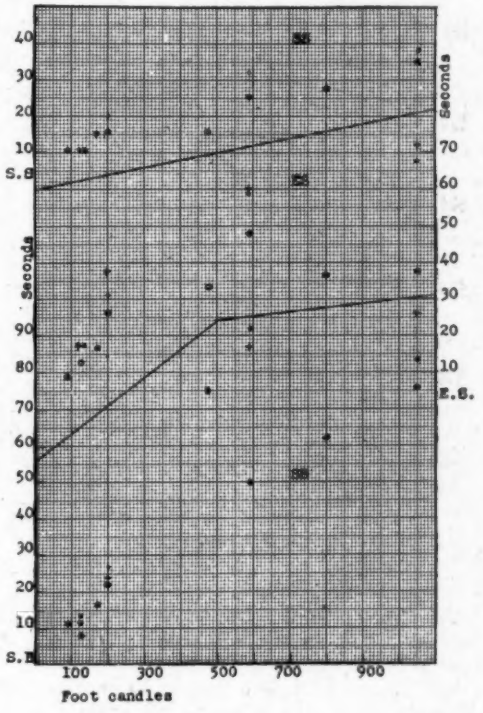

Fig. 1 (Simonson et al.). Time of recognition of 10 M.F.C. (ordinate) dependent on the level of preadaptation brightness (abscissa). In the upper part of the graph are the data of subject SS (upper left ordinate), in the central part those of subject ES (right ordinate), and in the lower part those of subject SB (lower left ordinate). The data are average values; the results obtained with lamp A are marked by solid dots (series I) and + (series II); those obtained with lamp B are marked by small circles; where the values of series I are 95, 170, 475, and 800 foot-candles and the values of series II at the same brightness levels as with lamp A.

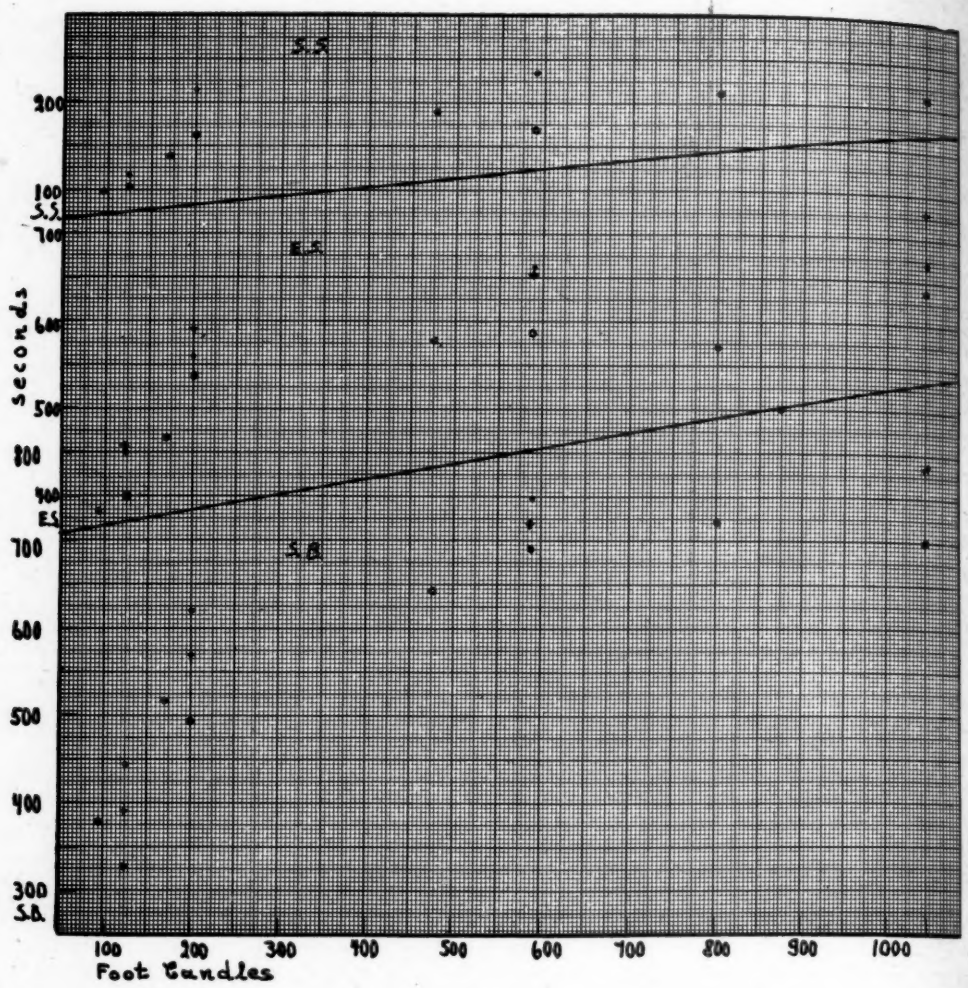

Fig. 2 (Simonson et al.). Dark-adaptation time until recognition of 0.05 M.F.C. (ordinate) dependent on the level of preadaptation brightness (abscissa). In the upper part of the graph are the values of subject SS, in the central part those of subject ES, and in the lower part those of subject SB. The data are average values; the results obtained with lamp A are marked by solid dots (series I) and + (series II); those obtained with lamp B by small circles, the values of series I at 95, 170, 475, and 800 M.F.C., the values of series II at the same brightness levels as with lamp A.

recognition of 10 M.F.C. as ordinates (seconds) plotted against the level of preadaptation brightness (foot-candles) as abscissas. Each value is the average from two to four experiments, performed on different days. In series I, lamp A (solid dots) was measured at 125, 200, 590, and 1,050 foot-candles and compared with lamp B at 95, 175, 475, and 800 foot-candles (small circles); in series 2, lamp A (crosses) and lamp B (circles) were compared both at 125, 200, 590, and 1,050 foot-candles. In subject SS (upper part of the graph) both arrangements were investigated on the same day. In all three subjects dark-adaptation time

tended to be shorter after exposure to lamp B than after exposure to lamp A throughout all levels of brightness except the lowest level in subjects SS and SB (lowest part of figure 1), where the duration was so small that the values were equal within the experimental error. It is known that the first values usually are the least accurate (Mandelbaum), owing to the interference of afterimages. Our procedure did not eliminate afterimages entirely, although it reduced their interference. The increase of the adaptation time with the increasing brightness of preceding light adaptation was most pronounced with subject SB, least pronounced with subject SS, who had the fastest dark adaptation speed. The different individual adaptation rates do not appear to influence the tendency toward shorter values with lamp B.

Figure 2 shows the average values of the three subjects for the recognition time of 0.05 M.F.C. as ordinates, plotted against the preceding light-adaptation brightness. There is also a distinct tendency to faster adaptation time after exposure to lamp B throughout all levels of preceding light-exposure brightness. Several values at the highest brightness level are somewhat lower than might be expected from the trend of the increase before. This is probably due to the interference of blinking and lacrimation reducing the effective light exposure. In general, the rate of the increase of the adaptation time is reduced as the higher brightness levels are reached. This reduction is somewhat less obvious when a logarithmic scale is used for the abscissa but is still present.

As in figure 1, with the initial values of 10 M.F.C., the increase of dark adaptation time with increase of the preadapting brightness was most pronounced with subject SB and least pronounced with subject SS. Again the individual speed of dark adaptation, the level of preadapting brightness within the range of from 100 to 1,050 M.F.C., the individual rate of increase did not appear to have any influence on the tendency to lower values after exposure with lamp B. Plotting of the average values of dark-adaptation time until recognition of 1 M.F.C. against preadapting brightness gave a picture very similar to figure 1 (10 M.F.C.) or figure 2 (0.05 M.F.C.); therefore, we refrain from publishing these data.

The transition point between cone and rod adaptation was also calculated for subjects ES and SB; in subject SS the dark-adaptation speed was so rapid that no definite transition point could be recognized, the same was true also in several experiments with ES and SB at the lowest brightness levels. After exposure

TABLE 1

AVERAGE, STANDARD ERROR, AND SIGNIFICANT RANGE OF DARK-ADAPTATION TIME AT 0.05 M.F.C. OF LAMP B IN PERCENTAGE OF LAMP A

Subject	Series I			Series II		
	Average Percent	SE	Range	Average Percent	SE	Range
SB	85.6	2.956	76.73–94.47	87.9	4.272	75.08–100.72
ES	85.3	2.52	77.74–92.86	88.0	1.862	82.41– 93.53
SS	77.7	5.326	61.72–93.68	83.1	3.317	73.15– 94.05
Total	84.2	1.86	78.62–83.78	85.7	1.90	80.00– 91.40

to lamp B there was a tendency of the transition point to occur earlier and at a lower threshold (as could be expected from the tendency of the average values in figures 1 and 2).

Owing to the considerable daily variations, the standard error of the average values could not be used to determine the statistical significance of the differences between lamps A and B. Two other procedures were possible: to calculate a) the significance of percentage variations (lamp B in percentage of lamp A) and b) the significance of the frequency distribution. Table 1 shows average and standard error of the dark-adaptation time of lamp B, in percentage of lamp A, at 0.05 M.F.C. The values were calculated from all experiments at all brightness levels for each subject. This is permissible, since the brightness level did not have a definite influence on the percentage difference between lamps A and B.

A range of the average plus or minus three times the standard error was calculated as probably a statistically significant range. If this range exceeds 100, the difference between lamp A and lamp B is statistically not significant. It can be seen that the value 100 was attained only at the extreme range in subject SB, series II; in all other arrangements the extreme range was below 100, and so was the total average. This shows that the faster adaptation time after exposure to lamp B, which is about 15 percent, is statistically significant. This concerns, however, only the average values, and does not exclude overlapping of single experiments.

The frequency distribution of higher, lower, or equal values with lamp A or B was calculated in percentage of the total number of experiments for each subject at the threshold values of 10 and 0.05 M.F.C., and for the total of all experiments on the three subjects (table 2).

TABLE 2

FREQUENCY DISTRIBUTION OF DIFFERENCE OF DARK ADAPTATION AFTER EXPOSURE TO LAMP A OR LAMP B

Subject	Expts.	Threshold M.F.C.	Percentage			Standard Error		Limits of Percentage Range of Faster Adaptation	
			Faster with Lamp B	Equal	Faster with Lamp A	Lamp B	Lamp A	Lamp B	Lamp A
SS	22	10.0	77.3	9.1	13.6	8.93	7.31	50.1–100	0.0–35.5
	22	0.05	86.4	9.1	4.55	7.31	4.44	64.5–100	0.3–17.9
ES	20	10.0	90.0	10.0	0	6.71	0.5	69.9–100	0 –1.5
	20	0.05	90.0	10.0	0	6.71	0.5	69.9–100	0 –1.5
SB	22	10.0	86.4	13.6	0	7.31	0.45	64.5–100	0 –1.35
	22	0.05	90.9	4.55	4.55	6.13	4.44	72.5–100	0.3–17.9
Total	64	10.0	84.4	10.9	4.7	4.54	2.65	70.8– 98.0	0 –12.65
	64	0.05	89.1	7.8	3.1	3.90	2.17	77.4–100.0	0 – 9.6

The standard error of this distribution was calculated according to Poll's[25] formula

$$E = \sqrt{\frac{P_1\% \times P_2\%}{N}}$$

where $P_1 = 100 - P_2\%$ and N the number of experiments. Differences of percentage distribution between lamps A and B by more than three times the standard error might be regarded as statistically significant. In order to use the formula for zero values of A or B, a small but

definite percentage (0.1 percent) was arbitrarily accepted.

It can be seen (table 2) that in the great majority of experiments (between 77.3 and 90 percent of all values) the dark adaptation was faster after exposure to lamp B and only between 0 and 13.6 percent faster with lamp A.

The probable extreme limits of frequency distribution are above 50 percent with lamp B and well below 50 percent with lamp A. Calculated from the total of 64 experiments, not less than 70 percent of all values may be expected to have a faster rate with lamp B at 10 M.F.C. and 77.4 percent at 0.05 M.F.C., while not more than 12.65 and 9.6 percent, respectively, will show a faster adaptation rate after exposure to lamp A. This difference of distribution is statistically significant; it concerns the probability of reproduction in a small number of trained subjects. The distribution in a large number of subjects will be discussed in a later part of this paper.

In view of these results it is interesting to investigate whether any factor is changed except the speed of dark adaptation by the changed spectral distribution in lamp B. In former investigations, similarity of the contour of dark-adaptation curves was used as criterion. This method, however, is not applicable when the speed differences are large; the contour of rapid dark-adaptation curves differs from that of slower rates, as has been discussed in the introduction. We thought that a suitable approach could be to investigate the relationship of one part of the dark-adaptation curves to other parts of the curve. We plotted the dark-adaptation time of average and single values at 10 and at 1 M.F.C. against the dark-adaptation time at 0.05 M.F.C. Figure 3 shows the average values of SB. It can be seen that both values with lamp A and lamp B follow the same trend, although the values with lamp B are somewhat to the left, owing to the shorter adaptation time. The same can be seen if the average values of all three subjects are plotted together (fig. 4). The break of the trend between 250 and 350 seconds' adaptation time at 0.05 M.F.C. (abscissa) is probably due to the fact that all values below 250 belonged to subject SS. This graphic analysis can be corroborated by calculation of the correlation coefficient between the adaptation time at 10 or 1 M.F.C. and that at 0.05 M.F.C. The correlation coefficient was calculated according to Spearman's formula. If single parts of the curve follow a different trend with lamp A and lamp B, it should be expected that the correlation coefficient is substantially lower when calculated from the total of all experiments with lamp A and lamp B together, compared to the values obtained from the series with either lamp alone. Table 3 shows that the correlation coefficient was very high with each, lamp A or lamp B, and was not essentially changed when both series are taken together. This shows that probably no other factor is changed except the rate.

Table 4 shows the average time of dark adaptation of 32 subjects, each investigated two or three times, with lamp A, lamp B, lamp B in percentage of lamp A (lamp A being taken as 100), and standard error (SE) of the percentage. The average values with lamp B are lower than those with lamp A at threshold 10, 1, and 0.05 M.F.C., the average percentage being 75, 70, and 74, respectively. The difference at 10 M.F.C. is statistically not significant, owing to large individual variations, as indicated by the high standard error. However, the difference at 1 and 0.05 M.F.C. is statistically significant. This procedure to prove statistical significance was chosen because the wide range of individual dark adaptation would

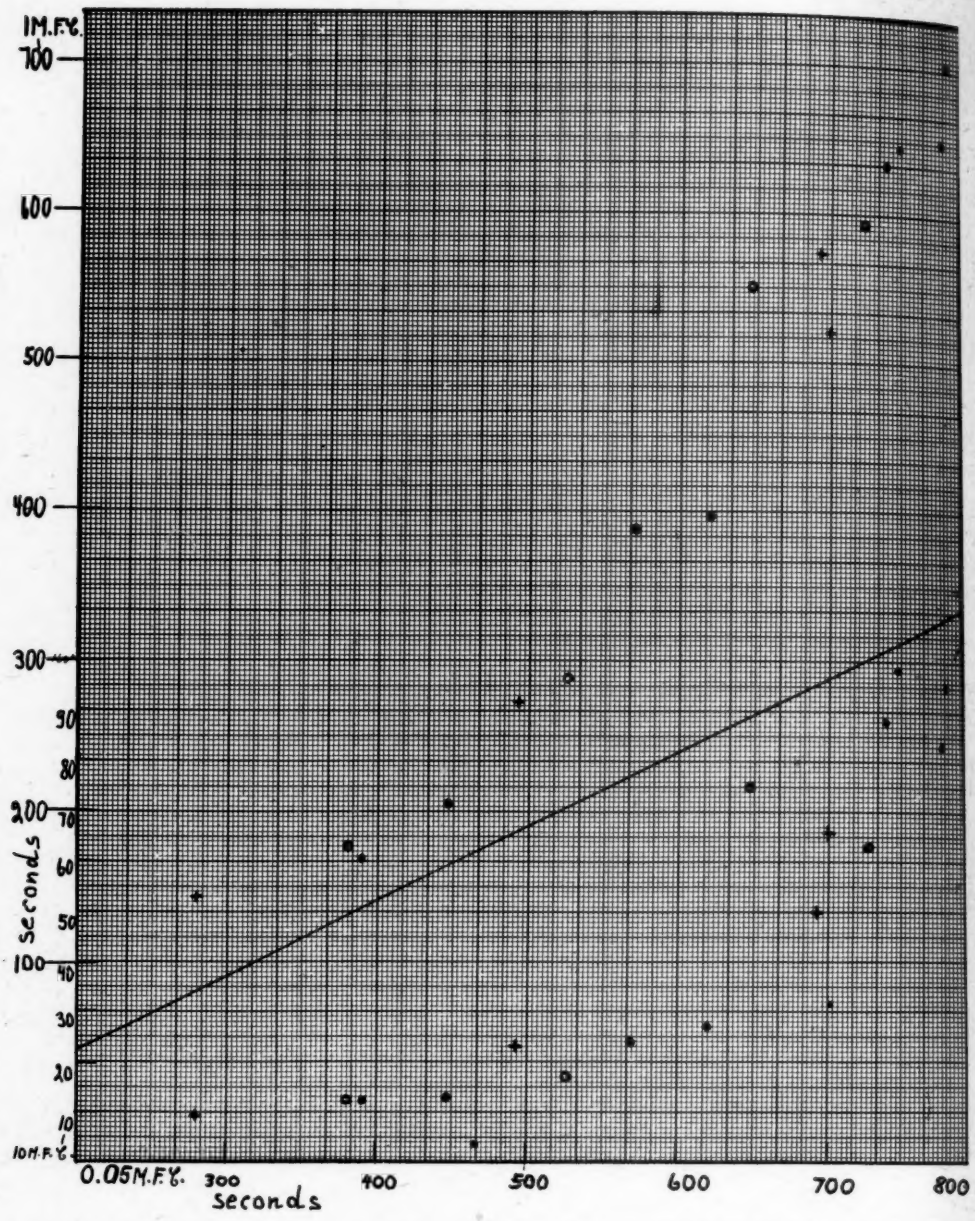

Fig. 3 (Simonson et al.). Relationship between dark-adaptation time at 10 M.F.C. (lower part, ordinate), 1 M.F.C. (upper part, ordinate), and at 0.05 M.F.C. (abscissa) in subject SB, Lamp A, series I, ●; lamp A, series II, +; lamp B, ○.

statistically overshadow the absolute difference between lamps A and B. Another procedure is to take groups of individuals with comparatively small differences. This subdivision was made according to the values with lamp A at 0.05 M.F.C. The individual variation was less pronounced near the average than in the extremely slow or fast groups. There were 10 subjects between 248 and 320 seconds (total adaptation time) with lamp A with an average of 275 seconds.

The corresponding average of this group with lamp B was 209 seconds. The difference (70 sec.) can be regarded as significant when exceeding the expression

$$2\sqrt{SE_1^2 + SE_2^2}.$$

The value of the expression was 8.46, so that the difference is highly significant.

0.05 M.F.C., where out of 73 determinations in 32 subjects, 62 (85 percent) showed faster dark adaptation with lamp B, with equal or faster values with lamp A in the remaining 11 experiments. From the standard error it was calculated that the lower probable range of faster values with lamp B was about 72.5 percent. At

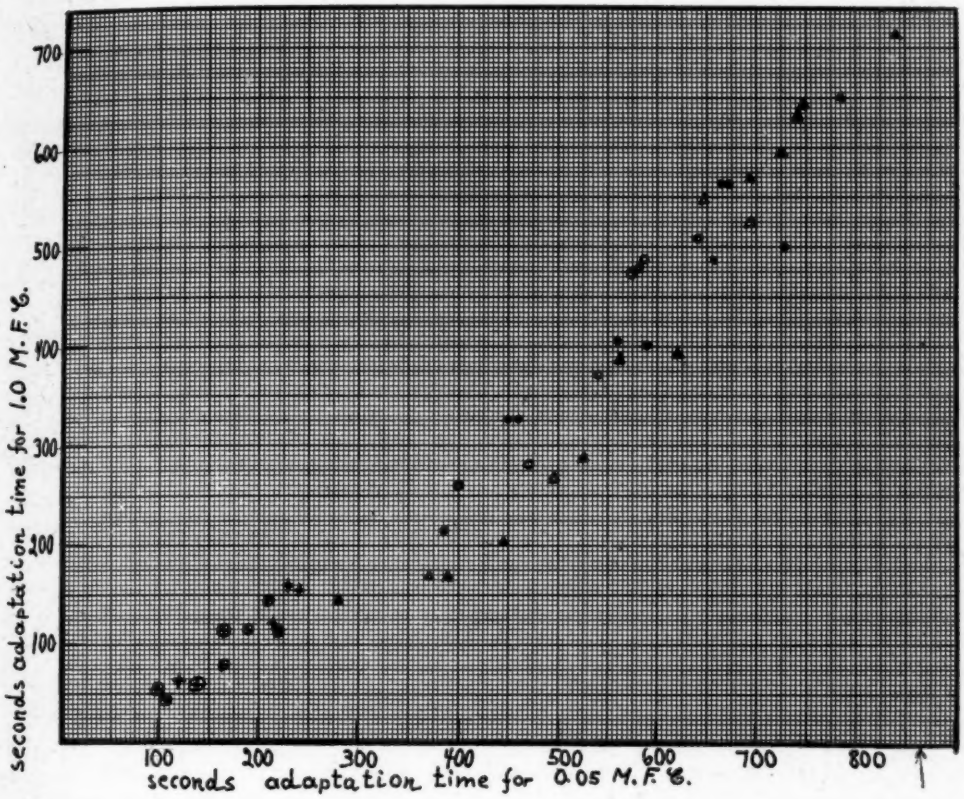

Fig. 4 (Simonson et al.). Relationship between dark-adaptation time until recognition of 1 M.F.C. (ordinate) and recognition of 0.05 M.F.C. (abscissa). Average values of three subjects: SS—lamp A, + ; lamp B, ⊕ ; ES—lamp A, ● , lamp B, ○ ; SB—lamp A, ▲ , lamp B, △ .

The same calculation was made with a consecutive group of eight subjects with values (with lamp A) between 360 and 403 seconds and an average of 380 seconds, the average of this group with lamp B being 278; the difference (102 sec.) exceeded the expression (55.42) and was statistically significant.

Statistically significant also was the frequency distribution of values at 1 and 0.05 M.F.C., 23 out of 32 subjects had a faster adaptation with lamp B in two experiments performed on two different days. In the other nine subjects, three experiments were performed which showed faster values after exposure to lamp B in two experiments in seven subjects, and in only one experiment in two subjects. Although the great majority of determinations showed a faster speed

TABLE 3

CORRELATION-COEFFICIENTS BETWEEN DURATION OF DARK ADAPTATION UNTIL RECOGNITION OF 10 M.F.C., 1 M.F.C. AND 0.05 M.F.C.

Subject	No. of Expts.	Lamp	Correlation Between	Coefficients
ES	20	A	10 M.F.C.–0.05	0.916
	20	B	10 M.F.C.–0.05	0.907
	40	A & B	10 M.F.C.–0.05	0.907
SB	21	A	10 M.F.C.–0.05	0.972
	21	B	10 M.F.C.–0.05	0.934
	42	A & B	10 M.F.C.–0.05	0.946
SS	12	A	10 M.F.C.–0.05	0.575
	22	B	10 M.F.C.–0.05	0.683
	34	A & B	10 M.F.C.–0.05	0.728
ES	20	A	1 M.F.C.–0.05	0.889
	20	B	1 M.F.C.–0.05	0.905
	20	A & B	1 M.F.C.–0.05	0.901
SB	21	A	1 M.F.C.–0.05	0.970
	21	B	1 M.F.C.–0.05	0.961
	42	A & B	1 M.F.C.–0.05	0.962
SS	12	A	1 M.F.C.–0.05	0.922
	22	B	1 M.F.C.–0.05	0.906
	34	A & B	1 M.F.C.–0.05	0.920
Average 3 Subjects	20	A	10 M.F.C.–0.05	0.860
	24	B	10 M.F.C.–0.05	0.805
	44	A & B	10 M.F.C.–0.05	0.828
Average 3 Subjects	20	A	1 M.F.C.–0.05	0.978
	24	B	1 M.F.C.–0.05	0.988
	44	A & B	1 M.F.C.–0.05	0.976

with lamp B, occasionally exceptions were observed, as is shown also in the series with trained observers. This series proves that the results with three trained observers are in line with those obtained on 32 untrained observers. Although the latter were investigated with only one brightness level, a generalization to other brightness levels appears to be possible. On the other hand, there is a discrepancy in the results at 10 M.F.C. Out of 73 experiments, 42, or 57.5 percent, showed a faster dark adaptation with lamp B. This percentage distribution is statistically not significant. The discrepancy might be due to the fact that the first values are the least accurate ones. On the other hand, it is possible that the immediate aftereffect of glare in untrained observers is the same in lamps A and B, and that the advantage of lamp B appears as dark adaptation proceeds.

TABLE 4

AVERAGE ADAPTATION TIME FOR 32 SUBJECTS

Threshold M.F.C.	Adaptation Time (Sec.) Lamp A	Lamp B	Lamp B in percent of A	SE	Significant
10.0	16	12	75.0	6.736	No
1.0	156	105	69.8	0.531	Yes
0.05	323	239	74.0	0.431	Yes

The 32 subjects were subdivided into four groups each of eight subjects according to the individual dark-adaptation speed with lamp A. Table 5 shows the average values and the percentage of lamp B, lamp A taken as 100. It can be seen that the percentage was about the same in all groups. This demonstrates that the difference between lamp A and

lamp B does not depend on the individual rate of adaptation.

Comment

The results show a statistically significant faster dark-adaptation speed in a lamp (B) whose spectral range has an appreciable reduction of the radiation at both ends of the visible spectrum. This difference probably does not depend on the level of preadaptation of brightness exposure, on daily variations, and on individual variations. A certain influence of training is present in the first reading (10 M.F.C.) after brightness exposure, in that significant differences between lamps A and B are obtained only in trained observers at this level. The results are compatible with Mandelbaum and Mintz's observations. They measured the cone dark-adaptation speed in different parts of the spectrum, using violet, blue-green, green, yellow, orange, and red test lights, after exposure to violet, green, and red light. Exposure to red light decreased significantly the dark adaptation in the red part of the spectrum (about 37 percent) and exposure to violet light slowed down the adaptation to the violet test light (15 to 20 percent) whereas in the medium part of the spectrum the dark-adaptation time was about the same after exposure to violet, green, or red light. Thus, if the extreme parts of the visible spectrum are reduced as is the case in illuminant B, it is conceivable that the adaptation rate is faster by elimination of those parts of the total adaptation curve which are slowed down by the action of the extreme parts present in the usual white light. While Mandelbaum and Mintz consider only retinal factors, the role of the central nervous system in dark adaptation is being widely discussed. The fact that illuminant B changes only the rate of dark adaptation without any other essential change of the curves cannot be used to support either assumption. The results are consistent with our finding of a more rapid increase of the fusion frequency of flicker with increasing brightness with illuminant B, which was interpreted as probably due to a diminished glare effect, but it is most likely that different factors are involved in dark adaptation and flicker phenomenon. Our results on dark adaptation cannot be transferred to the glare effect on other visual functions, such as visibility or surrounding halos, although there might be some relationship to the recovery of visibility after glare. For a complex evaluation of the glare effect of different illuminants different visual functions should be considered, the practical importance and applicability of which would obviously vary with the situations and conditions in which the illuminants are used. The usefulness of dark-adaptation tests in a comparative study has been demonstrated in the present investigation and it appears that the rate of exhaustion and recovery of photo-sensitive substances is so fundamental a process that it should not be neglected in the appraisal of the complex glare effect.

TABLE 5

AVERAGE DARK ADAPTATION TIME AT 0.01 M.F.C. OF FOUR GROUPS OF EIGHT SUBJECTS GROUPED ACCORDING TO INCREASING DURATION OF DARK ADAPTATION.

Group	Average (Sec.) Lamp A	Lamp B	Percentage
I	163	119	73.3
II	277	212	76.8
III	369	281	76.2
IV	483	343	71.1

Summary

In three trained subjects the cone dark adaptation proceeded faster after exposure to an illuminant (B) whose spectral range had a reduction at both ends of the visible spectrum as compared to the

usual frosted lamps (A). The difference was not significantly influenced by four levels of preadaptation brightness, by daily variations, and by individual variations. Evidence is presented that only the speed of dark adaptation is changed, without essential change of the contour of the curves. In a significant majority of 32 untrained subjects the cone dark adaptation was faster after exposure to lamp B, except the first readings at 10 M.F.C., where no significant difference between lamp A and lamp B was observed. The difference of dark adaptation between lamp A and lamp B was about the same in four groups of eight subjects, grouped according to the individual dark-adaptation speed. The usefulness of dark-adaptation experiments for the appraisal of the glare effect is discussed.

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BINOCULAR AND RED-FREE OPHTHALMOLOGY*

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The ophthalmoscopist should regard the choriocapillaris, lamina of Bruch, and the pigment layer of the retina as a single tissue that returns light to the examiner's eye. The rays are tinged a beautiful red by the blood in the choroidal vessels, and the small amount of light reflected by the retina is completely smothered. By changing the light, the choroidal component of the fundus picture may be reduced and the retinal element augumented until retinal details can be studied.

Jackson's use of sunlight for ophthalmoscopy was one of the early successful efforts to this end. An idea of his results can be gained by using strong white light in the eye of a young blonde with widely dilated pupil. About 1900, Affolter, Vogt, Lauber, Gullstrand, Holm, and others began experiments to make retinal details visible by filtering out objectionable rays from various kinds of light. Heine used green light, but the final practical program was worked out by Vogt and Affolter, using an arc light as the source and a filter of a 30-percent copper sulfate solution with 1 percent eiro-viridin blue. Early efforts were concentrated upon eliminating red rays, but it was found desirable to reduce the yellow component because it made the normal red fundus appear much darker. The hotter the source of light is made, the less red and yellow and the more green and blue rays are obtained. With the light source at 1,000° C., 55 percent of the output is red, 20 percent is yellow, and green is rated at 25 percent, but no blue is found. If an arc light is used, the temperature is raised to 3,500° C., whereupon red drops to about 15 percent, yellow falls even lower, while green rises to 60 percent, and blue is credited with 5 percent. The temperature of the sun is 6,000° C., which explains the red and yellow content of sunlight at 15 percent and 10 percent, respectively, with green up to 65 percent and blue at 10 percent. If red and some of the yellow are eliminated by filtering to permit the retinal image to appear, the loss at lower temperatures is so great that we cannot get results with any source short of the arc light. The No. 64 Wratten filter put out by the Eastman Kodak Company is one of the most successful for this purpose, but transmits only 27 percent of the light used. This explains why mercury-vapor light, nitra lamps, and the very best of our hand ophthalmoscopes cannot give a satisfactory fundus picture with the desired retinal details.

Dry filters have not produced satisfactory results for me, but the filtering tank cannot have an inside diameter of more than 10 mm. or the loss will impair the brightness of the image. If the macula appears as a rich yellow area with clear foveal reflex and papillomacular fibers can be made out as they arch from the disc to the macular area, we are sure to have a satisfactory red-free light. There is no agreement as to the source and significance of the yellow color of the macula. Vogt attributes it largely to selective absorption of light by the pigment epithelium and reduced coloring by the choroidal blood. As the area of this colored zone in red-free light coincides with that seen in the human retina removed immediately after death and the ophthalmoscopic picture is constant, we can ac-

* Presented at the eightieth annual meeting of the American Ophthalmological Society, at Hot Springs, Virginia, June, 1944.

cept it as a standard without discussion. The pupil must be dilated and the eye able to withstand strong light. Vitreous haze prevents its use, and it is a supplement to our very effective hand scopes but never replaces it. The old-fashioned hand ophthalmoscope is used according to the direct method, and I have never seen any bad results from this set-up. There have been no important additions to the literature of this subject for the past decade.

What are the details seen with red-free light, and do the advantages justify the time and trouble necessary?

As a rule, choroidal defects become less evident, and retinal details invisible in white light can be seen. The illustration of Vogt's slitlamp atlas are marvels of accuracy in detail and color, but the illustrations of red-free-light fundi in the published articles are beyond anything I have seen. I have not seen the changes in the papillomacular bundle in simple and retrobulbar neuritis, nasal sinusitis, the amotio retinae of trauma, and multiple sclerosis claimed for this method. One of Vogt's triumphs is his study of the macula in albinism and the demonstration that the appearance of the macula in red-free light corresponds with the central acuity in the case.

Most of the important fundus lesions begin in the choroid and involve the retina later. In the past, we have been satisfied to assume that early retinal changes existed when vision was reduced. In many cases of this type it is possible to see the retinal changes in the macula in the very early stages. On the minute macular vessels one can also see the fine varicosities which precede hemorrhage.

Hereditary macular degeneration may show an imposing mass of white spots in and about the macula, with vision at 20/20. In some of these cases the number of additional white spots made visible by the red-free light is amazing. In striking contrast, another case may begin with minute macular pigment and rapidly fading vision. At times, it becomes an important question whether a macular defect is congenital or progressive. In each type, red-free light will explain the apparent contradictions. In the fundus of an eye with pigmentary retinitis, pigment clumps, not visible in white light, may be seen beneath a film that is probably gliosis of the retina, which is a part of the disease and occasions the diagnosis of choroideremia and retinitis pigmentosa sine pigmenta. Inherited syphilis is often accompanied by marked peripheral pigment changes which gradually fade. This may be followed by "watered-silk effect" in the macula and progressive loss of vision. The changes in the macula itself can be made out at a time when white light will show nothing but high reflexes.

The original binocular ophthalmoscope was bulky, difficult to keep in adjustment and not easy to operate. It never came into general use, but both Zeiss and Bausch and Lomb have put out simpler and more effective models well worth while. The image is about twice the size of the hand scope, reducing the area of the available field. Very little vitreous haze prevents its effective use; the pupil must be wide and the eye able to tolerate the amount of light necessary. This instrument permits an appreciation of the third dimension giving an image of the retina as a delicate film, just short of transparency, standing out in advance of the red fundus background. In this retinal film ramify the retinal vessels, and it is easy to locate a lesion in the retina or in the fundus behind it. A diagnosis of swelling of the disc can be made by observing the course of the vessel stalks as they emerge from the disc. What may seem to be a solid mass in the fundus when viewed through the hand scope may be resolved into a lesion of the fundus background, with

an optically empty material pushing the retina forward in front of it. The ability to look into a congenital cyst of the optic disc must be experienced to be appreciated. What may look to be bare sclera with the hand scope may be an organized exudate projecting into the vitreous. The ectasias of extrapapillary colobomas stand out boldly. Angioid stripes look like blood vessels to the monocular observer, but the binocular scope flattens them out to streaks of pigment granules continuous with the pigmented fundus background around the optic disc.

Fig. 1 (Lloyd). Partial avulsion of the optic nerve. Painted from observation through the binocular ophthalmoscope.

Some success has been attained by placing a dry filter in the lighting system and stepping up the current to produce red-free light. It is not so good as the arc light and liquid filter but is very satisfactory and easy to handle. The binocular scope is a great help to the artist making fundus sketches. Neither of these instruments is indispensable, and the oculist can discharge his full responsibility to his patient without them. The binocular scope is expensive, but the apparatus for red-free light is cheap. Both must be ready for instant use to get results. They can never take the place of the present hand scope, which is the most effective instrument we have. A series of kodachromes of fundus paintings made with the help of the binocular scope will be shown to make the meaning clearer. I have no red-free fundus pictures of my own, because direct ophthalmoscopy is too difficult and we cannot subject the patient to prolonged exposure to this strong light. Here is the ideal place for the binocular ophthalmoscope with proper filters and an arrangement to step up the amperage to compensate for the removal of red and some of the yellow rays.

It was not possible to reproduce the illustrations used when the paper was presented, but a few will be shown here to indicate some of the advantages of both red-free light and binocular ophthalmoscopy.

The finest illustration of the penetrating power of binocular ophthalmoscopy will be seen if the reader will look in volume

22, of the American Journal of Ophthalmology, page 760. There is an illustration of a "prepapillary congential cyst containing a moving vascular loop." The article is by Dr. Levitt and myself. Figure 1 of this article shows the torn and retracted fibers of a case of partial avulsion of the optic nerve. During a game of basketball, the patient's eye was inadvertently jabbed by an opponent's finger, producing a severe vitreous hemorrhage and total loss of vision for a time. The blood was absorbed, and although the patient has 20/20 vision the entire

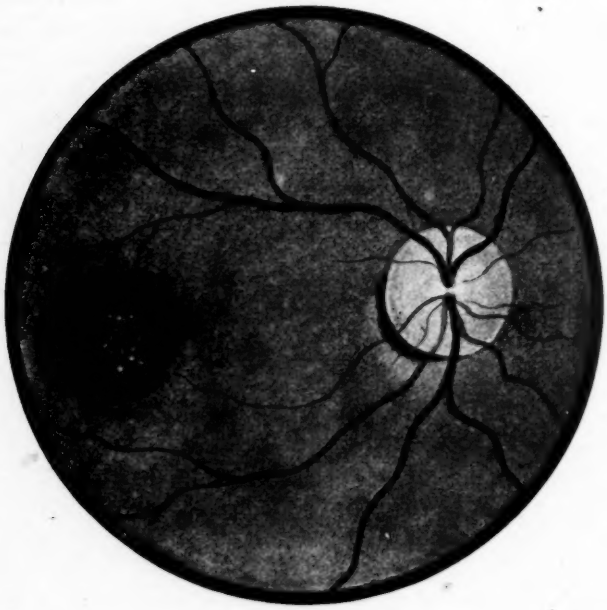

Fig. 2 (Lloyd). Senile type of hereditary macular degeneration with normal vision.

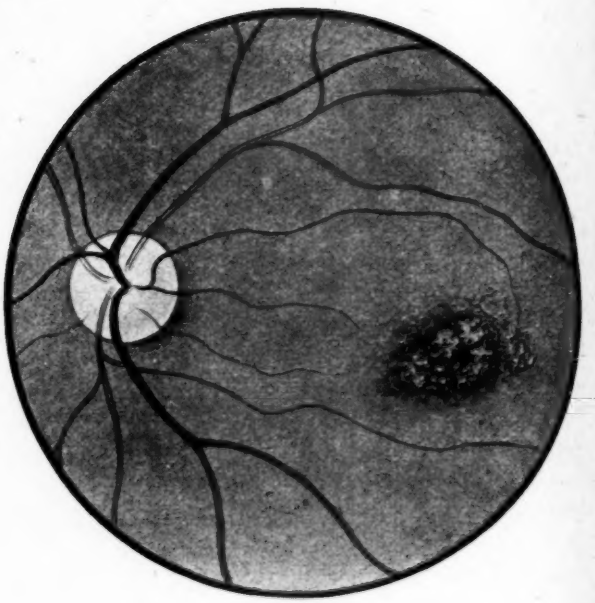

Fig. 3 (Lloyd). Serious type of hereditary macular degeneration with vision of 10/50 and 10/70.

lower half of the field was lost and the eye is of little use. The tear is plainly seen, and the wrinkling of the retina about the disc is evidence of the severity of the damage. The binocular scope showed the torn nerve fibers very clearly, and the details were much more clearly seen than with the hand scope, although the diagnosis should be made with its use alone. Figures 2 and 3 are cases of senile macular change and types of hereditary macular degeneration. Figure 2 shows the fundus of a man in his 60's, with an acuity of 20/20. The spots are of the type seen frequently with good vision at least early in the case. Only one case of this type has been examined under the microscope, and the changes were located in the lamina of Bruch. The spots are frequently seen in younger people and have been called "guttate choroiditis" and "honey-comb choroiditis." The macula retains it normal yellow-brown color in these cases until pigment changes set in, whereupon the vision drops. Figure 3 is the fundus of a man aged 39 years who stated that his vision had been failing for the past year or so. When viewed with white light, a watered-silk sheen was observed over the macular area which could be changed by shifting the angle or position of the scope. The visual acuity was down to 10/50 and 10/70, which was out of all proportion to the amount of change seen. Using red-free light, one could see a delicate lace work of gauzy nature in the retina; the normal yellow brown of the macula was almost gone.

This picture was painted from observation, the artist using a binocular ophthalmoscope. The "ghost" is omitted to permit the details to appear.

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THE CAUSE AND TREATMENT OF POOR VISION IN ANIRIDIA

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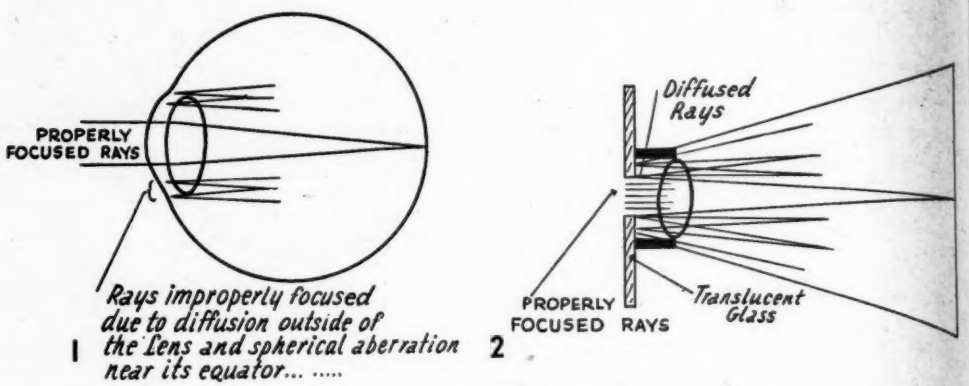
Aniridia is a congenital lack of iris, hereditary in nature, almost always bilateral, occurring as a dominant characteristic. The most obvious signs of the condition are photophobia, contraction of the palpebral fissure, evidence of difficulty in focusing, and the general appearance of an unusually large pupil.

This paper will deal with the cause of the poor vision usually found in uncomplicated cases of aniridia and describe a treatment which has been used very successfully.

Berens[1] explains the poor vision in cases of aniridia as follows: "The reduction in vision is due to an aplasia of the fovea centralis, a defect which has been found on histologic examination and which may also account for the photophobia present."

Duke-Elder[2] states that "in the absence of other anomalies, the frequent occurrence of poor visual acuity may be accounted for by the fact that in several cases, clinical examination has shown that the fovea is absent."

The present writer believes that if the pathologic change occurring in aniridia were explained to any one versed in the science of photography, another cause of the poor vision would immediately occur to him; namely, the aberration of the light entering the eye in the region both outside and insight the equator of the lens. According to Friede,[3] Ishikawa was the first to advance this theory as to the cause of poor vision in aniridia.



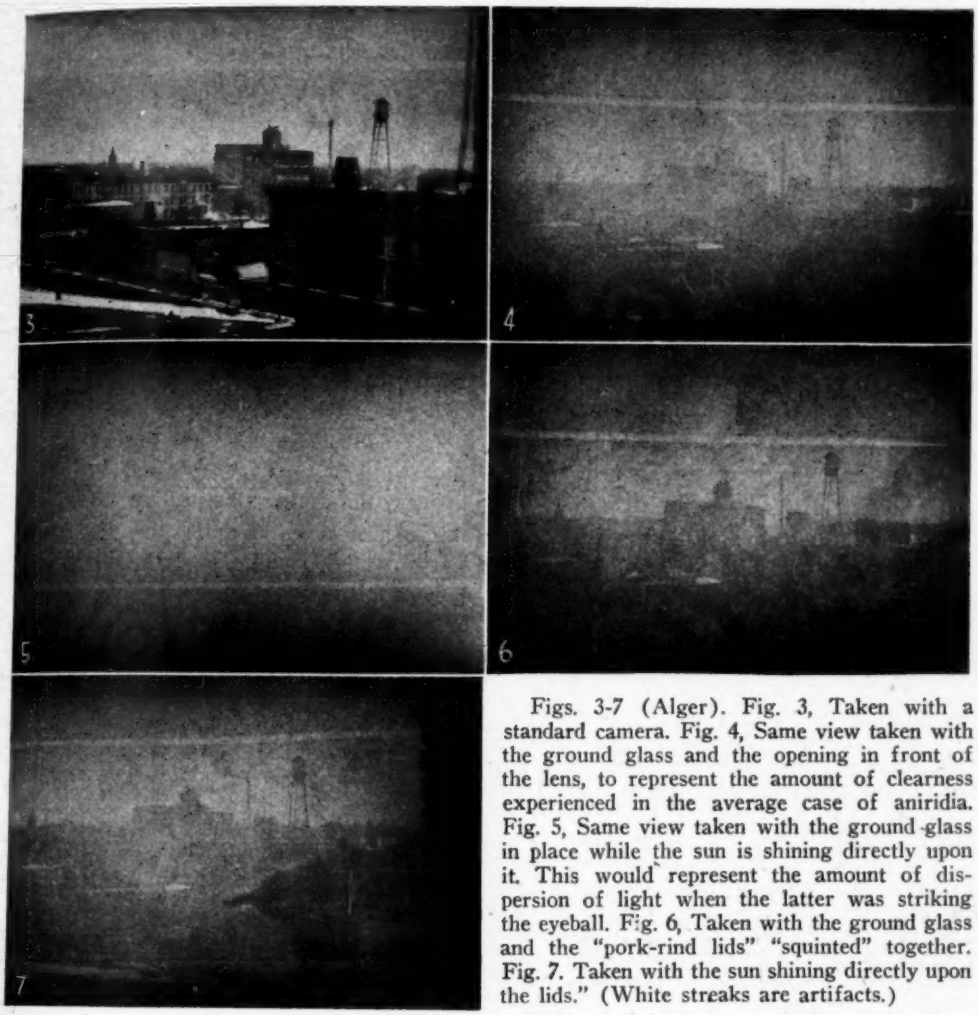
Figs. 1 and 2 (Alger). Schematic drawings to show light entering: Fig. 1, the eye in a case of aniridia. Fig. 2, the camera with a piece of perforated ground glass in front of the lens.

In order to illustrate this aberration, the present writer has devised certain experiments which are designed to show: 1. The aberration of light in cases of aniridia when the eye is wide open. 2. The aberration of light in cases of aniridia when the lids are "squinted" partly shut. 3. The added aberration when the light is shining directly upon the lids and the eyeball of an eye under the two foregoing circumstances.

To illustrate this, a hole was drilled in a piece of ground glass, representing light entering a camera in a diffused fashion, as compared to light similarly entering the

eye in a case of aniridia. Figure 1 represents the eye in a case of aniridia.

Figure 2 represents a camera with a piece of perforated ground glass in front of the lens. The dispersion of light coming through the ground glass would about equal that at the edge of the lens in a case of aniridia, but with this distinct difference; namely, the translucent glass would disseminate the light evenly over the film, causing a general cloudiness of the picture. In a case of aniridia, however, the dispersion of light passing through the edge of the lens tends to be deflected toward the foveal region. When the subject is looking in the direction of a bright light, such dispersion would cause a greater blurring than would the ground glass in the case of the camera. This partly accounts for the added discomfort experienced in a case of aniridia when the subject looks toward a window or bright light. In order to represent the effect of the lids, a piece of pork rind was cut with a slit to represent as nearly as possible the correct



Figs. 3-7 (Alger). Fig. 3, Taken with a standard camera. Fig. 4, Same view taken with the ground glass and the opening in front of the lens, to represent the amount of clearness experienced in the average case of aniridia. Fig. 5, Same view taken with the ground glass in place while the sun is shining directly upon it. This would represent the amount of dispersion of light when the latter was striking the eyeball. Fig. 6, Taken with the ground glass and the "pork-rind lids" "squinted" together. Fig. 7. Taken with the sun shining directly upon the lids." (White streaks are artifacts.)

width of the lids when a patient is "squinting" his lids together. Then, with the same exposure and the same opening in the shutter, the following photographs were taken, as shown in figures 3 to 7.

These illustrations represent approximately the present writer's conception of the various degrees of light dispersion to which a person with a case of aniridia is subjected. It would seem that the aberration of light is at least an extremely important, if not the only, cause of the poor vision and the photophobia in uncomplicated cases of aniridia and albinism.

As opposed to the theory that the cause of the poor vision is due to lack of a fovea centralis is the fact that the latter does not develop fully until 16 weeks after birth. Just what causes it to develop after birth is not known, but it is probably due to the light striking it and stimulating it, simultaneously along with the nerve stimulation that is carried to the brain. In the case of aniridia and of albinism, the light is not concentrated at the macula in a clear pattern of an image and the stimulation of the macula does not take place as it would in ordinary eyes. Consequently, the macula would not have a tendency to form in a normal fashion.

In support of this theory, reference is made to the interesting case reported by Friedman,[4] in which the macula was destroyed at birth and the adjacent retinal tissue developed into a macula. While Friedman offers another explanation for the development of the false macula, he offers no proof of his theory and, therefore, his case adds to the weight of the argument here advanced.

Several investigators have tattooed the corneas of albinos, others have prescribed peripherally opaque contact glasses in cases of aniridia and of albinism. A great improvement in vision and a loss of the photophobia have resulted. These results further substantiate the "diffusion theory" of poor vision in cases of aniridia and of albinism.

The question arises: If the aberration of light is the cause of the poor vision, then why should patients in a few cases of aniridia have 20/20 vision? Aniridia is not a definite entity, but varies from only a small loss to a nearly complete loss of the iris. Perhaps the variable vision may be explained on the basis of the variable amount of residual iris. If this has been worked out clinically, it is not known to the writer but it would seem to be a logical premise upon which to base conclusions.

If the foregoing concept as to the cause of poor vision is correct, it would seem that the treatment would be to render opaque the outer portion of the cornea in cases of aniridia, and to render opaque not only the periphery of the cornea but as much of the anterior sclera as possible in cases of albinism. Furthermore, to be successful the operation should be performed while the eye is in its developmental stage; that is, within the first three years of the child's life.

The writer has been unable to find in the literature any case in which this method of treatment has been applied in cases of aniridia. Two surgical texts mention it as a treatment: Spaeth[5] recommends the treatment in his book on ophthalmic surgery and Wiener, and Alvis[6] condemn the treatment. In neither volume is any reason offered for the opinions given nor have the authors been able to supply the writer with case reports. However, the method has been used in cases of albinism with reasonable success. Kreiker[7] attempted to tattoo the inner surface of the lids but failed because of sloughing. Friede[8] discussed the

theories of Fritsch, Elschnig, and Ishikawa, their theories being, respectively, that poor vision is due to a lack of a fovea, to a high refractive error, and to a diffusion of light. He states that although there is much in the literature as to the cause of the condition, there is, unfortunately, practically nothing on therapy. He first tried injections of India ink in the fornix and subconjunctivally. This produced a distinct and marked clinical improvement, but the cosmetic effect was that the lids and conjunctiva were darkened and made unsightly. He next opened Tenon's capsule above and below and with a spatula inserted a thick paste of India ink. This gave a very good result clinically and without quite such poor cosmetic results. However, Friede admits that in both cases the black conjunctiva had an unsightly appearance. He corrected it, however, to a large extent by a surgical narrowing of the lids. This alone, he finds, is not enough. There remains the darkening of the periphery of the cornea.

Friede reviews the literature of his time on this subject, citing Komoto, Galtier, and Wilson. Komoto gave up with one attempt, stating that the undertaking was too difficult. Wilson, however, tattooed the cornea with unusually gratifying results as to the photophobia. Friede also reviews the possibilities of using paraffin impregnated with India ink in the unexposed portions of the sclera, warning that the danger of paraffinoma is not to be disregarded. Two years later the same author[3a] gives a further report: "Das Problem der operativen Verbesserung der Sehleistung des gänzlich albinotischen Auges, zugleich Kritik der Goldfärbung der Bindehaut nach Knapp." He here reviews his own endeavors previously to darken the sclera; also his attempted use of contact glasses with an opaque periphery, mentioning not only their helpfulness but also their many disadvantages. He suggests that the cornea should preferably be tattooed with India ink since he disapproves of the deep opacity that the gold chloride forms.

A report by Reid[8] is also of interest. He presents a case of aniridia, in a salesman, aged 28 years. Vision was 6/12 and the patient had intense photophobia when exposed to a "bright room or diffuse daylight." Reid fitted him with contact glasses, obtained 6/6 vision, and eliminated the photophobia.

For many years the present writer has wished for an opportunity to try tattooing the cornea in a case of aniridia. Three years ago such an opportunity presented itself. The case report follows:

On July 11, 1941, S. H., a female aged 20 months, was brought for examination. The child showed a marked tendency to avoid light from the windows of the office. Her eyes were rather difficult to examine because of her dislike for the light of a flashlight or ophthalmoscope. A typical aniridia was found, with the edge of the lens clearly visible throughout the entire equator. There was no nystagmus. No fovea could be seen, but it was not possible at the time to make a thorough examination of the fundus.

The parents of the child had taken her to other ophthalmologists who had given her opaque "glasses" with multiple holes. These the child would not wear. She did seem to do better, however, with tinted lenses which the parents had given her. The condition was explained to the parents and the treatment of tattooing the cornea was suggested to them. They were willing to try it.

Since Friede had shown a preference for India ink as compared to gold chloride, I decided to try it. The tension was

taken at the time of the operation and found to be 20 mm. Hg (Schiøtz). Only the lateral and medial portions of the cornea of the left eye were tattooed. The eye healed in about one week; then the same treatment was performed on the right eye, which also healed in about one week.

The parents returned two weeks later and said that the child would now stand and look out of the window for the first time. They were positive that she was distinctly better. Since the coloring was by no means complete, the tattooing of the right eye was repeated. The parents were not well-to-do, and the child was allowed to go home before the cornea was healed. This was a mistake. A severe ulceration took place in the right eye and extended past the center of the cornea by the time she was returned for treatment. She was hospitalized, a delimiting keratotomy performed, and the ulcer cauterized. It healed, but half of the cornea was badly scarred.

The parents were not discouraged, however, and wanted the second tattooing performed on the left eye. This time platinum chloride was applied to a small area, experimentally. The eye healed uneventfully, and so the lateral and medial portions of the cornea of the left eye were tattooed two weeks later. Subsequently the same procedure was used on the right eye. The tattooing extended fairly well around the cornea, but it was thought best not to encircle the cornea completely for fear of interfering with its nourishment.

In three weeks' time photophobia in the left eye had completely disappeared. The child could easily find a penny thrown 15 feet from her. Photophobia continued in the right eye for four or five months, probably attributable to the cause of photophobia in the original aniridia; namely, the blurring of the light. (Duke-Elder[2] mentions this annoying effect of scar tissue.) As the cornea cleared, the photophobia of the right eye disappeared, as was evidenced by the fact that the patient no longer kept the right eye closed.

The last time that she was seen in the office in May, 1943 (two years after the operation), her vision was about 20/20 in the left eye; in the right eye it was almost as good. She could play outside with other children and had no photophobia.

Conclusions

Probably nothing definitely new as to the cause or treatment of poor vision in aniridia has been presented. The subject is discussed in the hope of dispelling the now prevalent defeatist attitude toward the treatment of this condition. Moreover, this treatment seems to have been very rarely attempted and thus this case should be worth reporting.

The results obtained tend to disprove the theory advanced by Berens and Duke-Elder that the photophobia is due to the lack of a fovea centralis. The photophobia was so definitely noticeable before surgery and so entirely lacking after surgery that in this case, at least, it must have been caused by the aberration and dispersion of light passing through the periphery of the cornea.

No information is available as to whether the patient in this case had an undeveloped fovea when first treated. The child was too young and too apprehensive to allow of a good fundus examination while she was awake; unfortunately no written note of the fundus findings was made when she was under anesthesia. Although the fundus was examined with an ophthalmoscope while the child was anesthetized, the chief concern was to ascertain the amount of pigmentation on the cornea, and the fovea was not given much attention at the time.

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ANISEIKONIA AND SPATIAL ORIENTATION*

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Introduction

The various types of sensory and conceptual visual data by which man perceives the location of objects in space and the orientation of those objects relative to his own body may be divided into the uniocular and binocular categories. The uniocular data are derived from vision in one eye alone, whereas the binocular data can arise only from simultaneous perception of stimuli reaching the two eyes.

A person who has been one-eyed for some time usually localizes objects with considerable accuracy and is able to perform fairly fine tasks involving visuomanual coördination. He obviously must rely upon the uniocular data for his orientation in space. The more important of these uniocular factors may be listed as follows:[1] parallax, which is associated with head and eye movements; the overlay of the nearer objects upon the more distant; the size and shape of known objects; linear perspective; clearer delineation and finer detail associated with near objects; arrangement of areas of light and shadow; increased brightness associated with nearer objects; coolness and warmth of color associated with far and near; vertical position, in which the higher is the more distant, and other factors. These uniocular factors are also constantly operative in binocular vision, substantiating or correcting the spatial localization derived from the binocular data.

The outstanding fact of binocular spatial depth localization is the phenomenon of depth perception, which arises from the disparities between images on the two retinas (stereopsis). These disparities are due to the fact that the two eyes are separated in space. Objects located at different distances in the field of view are imaged differently in the two eyes and are, in general, imaged on so-called disparate elements of the two retinas. When sensory fusion or near-fusion of these retinal images occurs, the singular quality of a third dimension is directly perceived. Stereopsis is not restricted to the central parts of the field of vision, but exists for objects in the entire binocular field of view.

In studying the act of vision, the fundamental difference between the uniocu-

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lar and binocular clues to depth perception must always be kept in mind, but it must also be understood that man's unerring orientation in space is made possible only by the constant interaction of both sets of clues*

The information derived from the disparity clues alone may, under certain conditions, not agree with the prior knowledge of the objects viewed. In these circumstances the monocular clues will modify and rectify the incorrect information obtained from the disparity clues and may completely dominate them or lead to their suppression. Such a condition occurs, for example, when differences in the size of the images of the two eyes are introduced, by placing a meridional size lens† in front of one eye.

In normal binocular vision the stereoscopic localization and orientation of objects in space are substantially correct; that is, they are in accord with the actual positions of the objects seen.‡ But if differences are introduced in the relative size of the retinal images, for example by size lenses, all the disparities between the two eyes will be changed and the objects in space will appear incorrectly localized and oriented with respect to each other. This was one of the important facts brought out in the early work on aniseikonia by A. Ames, Jr., and his collaborators.[4]

However, the incorrect orientation of objects produced by size lenses is more noticeable in some environments than in others. In 1935, Ames stated the essential facts of the problem from evidence obtained in studying aniseikonic patients on the so-called tilting board; namely, that subjects with aniseikonia do have an incorrect binocular space perception, but "the extent to which their total visual judgment is affected by their false stereoscopic sense depends upon the predominance of perspective (uniocular) features in the field of view."[5]

The results of three recent investigations throw additional light on this subject and substantiate the foregoing statement. The first deals with the effect upon spatial orientation of the prolonged wearing of a meridional size lens in front of one eye, which introduces an artificial aniseikonia.[6] The result of the second investigation shows that the type and degree of aniseikonia present in patients can be determined by using as the criterion of measurement the incorrect binocular spatial localization which their particular

* It is generally considered that stereopsis has a physiologic basis, founded on the anatomic organization of the visual apparatus, and affords a direct perception of the depth relationship of objects which is unequivocal although possibly incorrect. The monocular clues (the "secondary motives of depth localization of Tschermak"[1]) are said to be psychologic, since they are the result of an interpretation or conception (Duke-Elder[2]) of the depth relationship of objects; these clues are by their nature equivocal. Stereoscopic depth perception is assumed to be innate (that is, acquired phylogenetically), whereas the judgments based on uniocular depth clues would be empirical (that is, acquired by past individual experience). In contrast to this dualistic concept a unitary theory of depth perception is developing which considers all clues to depth perception to be the product of past experience (of the individual and the species), the governing principle being the significance or meaning of the depth relationship of objects to the organism. In such a concept (which will be elaborated by A. Ames, Jr., in forthcoming publications) there would be no room for a fundamental difference in the nature of the monocular and binocular factors of depth perception. For the purpose of the present paper the nature of the different factors is of no importance as long as it is understood that the monocular and binocular factors are to some extent independent, but that there is, on the other hand, a significant interdependence between the two in the total act of spatial orientation.

† A size lens is a magnifying lens designed so that the virtual image seen through the lens is substantially at the same position as the object itself, but magnified. These lenses may be either overall or meridional, the latter magnifying in one meridian only.[3]

‡ The philosophical aspects of this rather over-simplified statement need not be considered here.

aniseikonic error should produce.[7] The third and most recent investigation presents evidence that a correlation exists between the measured oblique-meridional aniseikonic errors as determined by the incorrect binocular spatial localization and those computed from the magnitude and the axes of the corrected astigmatism at oblique axes.[8]

This paper will discuss the results of each of these investigations in so far as they provide additional information on the problem of how patients with aniseikonia deal with the incorrect binocular spatial localization associated with the existing aniseikonic errors.

I

A meridional size lens when placed at axis 90° before one eye of a person with normal binocular vision introduces a change in all horizontal disparities of the images in the two eyes and therefore causes immediately a typical disorientation of objects in the individual's surroundings. If the lens is placed before the right eye, objects located in the right half of the field will appear larger yet farther away than objects of the same size located at the same distances in the left half of the field. A flat-top desk appears to slant down on the right and up on the left; it no longer appears rectangular. A wall in front of the subject will appear nearer on the left side and farther away on the right. The ground upon which the observer walks will slant down toward the right as though he were walking on the side of a hill. His hands held up before him will appear unequal in size, the right being larger. The shapes of objects will generally be distorted, a square magazine appearing trapezoidal, round objects such as ash trays, wash basins, and the like, appearing elliptical. The image of an individual looking at himself in the mirror will appear asymmetrical, with the left side protruding. Not all individuals perceive these distortions equally well in ordinary surroundings, but they were very marked for all observers who took part in the study described in this section.

If the lens is worn constantly for several days,[6] the spatial distortions gradually disappear and finally are not seen at all in ordinary surroundings. It soon becomes impossible to see the distortion even when one's attention is directed closely to particular objects. The time necessary to reach this stage varies somewhat with the amount of magnification introduced by the lens, but usually three or four days are sufficient.

Thus, in so far as ordinary surroundings are concerned, the adaptation to the image-size difference between the eyes, introduced by the size lens, seems complete. However, when in an open field, or on a hill covered with high grass, or, in general, in places where there are few uniocular clues, such as perspective and rectilinear forms, the distortion reappears suddenly. This phenomenon has been experienced time and again, even after the lens had been worn constantly for over two weeks.

These observations lead to the conclusion that an individual with normal binocular vision can become accustomed to image-size differences artificially introduced by size lenses, in the sense that objects are seen in their true shape and correct position if the surroundings are such that the familiar uniocular clues are sufficient in number and strength to dominate the incorrect perceptions conveyed by the stereoscopic factors of spatial localization. Where the surroundings do not offer strong familiar uniocular clues, the stereoscopic factors become effective again and the distortion reappears. These facts suggest that in spite of the disappearance of the incorrect spatial orientation, the basic image-size difference

created by the size lens has not been overcome in the process.

This hypothesis was tested by measuring the image-size differences several times a day during the prolonged wearing of the size lens. The measurements were obtained on the horopter apparatus and the space eikonometer, both of which depend upon binocular spatial localization, and on the standard eikonometer, which depends upon the direct comparison of the apparent sizes of a dissociated test object, as seen by each eye. All three instruments contain a minimum of uniocular clues. The results obtained with the three instruments were substantially in agreement in all experiments. Three persons took part in the study, each wearing a meridional size lens of 1.5%, 3%, or 6% at axis 90° before one eye, at different periods, thus introducing differences in the size of the retinal images in the horizontal meridian. The image-size differences of each subject were determined at regular intervals during the day and on each successive day before, while, and after wearing a given size lens. Each subject also reported his daily subjective experiences concerning the appearance of objects in different surroundings.

The results of the measurements showed that on the whole the actual image-size difference did not disappear with the continued wearing of the lens as did the distortion of objects in space. Figure 1 shows graphically the measuured image-size differences before, while, and after wearing the size lens in two experiments. There was a certain decrease in the amount of the measured image-size difference during the first few days. This decrease became less and less, until a fairly constant value was reached. This change could represent a partial compensation for the image-size difference introduced by the size lens. Its magnitude varied with the subject, the magnification of the lens, and with the time of day. The compensation was greater after the day's work than in the morning after a night's sleep. The latter was especially true if an occluder was worn over one eye before the measurements were taken in the morning. The magnitude of the compensation depended also on whether the lens was worn before the right or the left eye. One subject showed practically

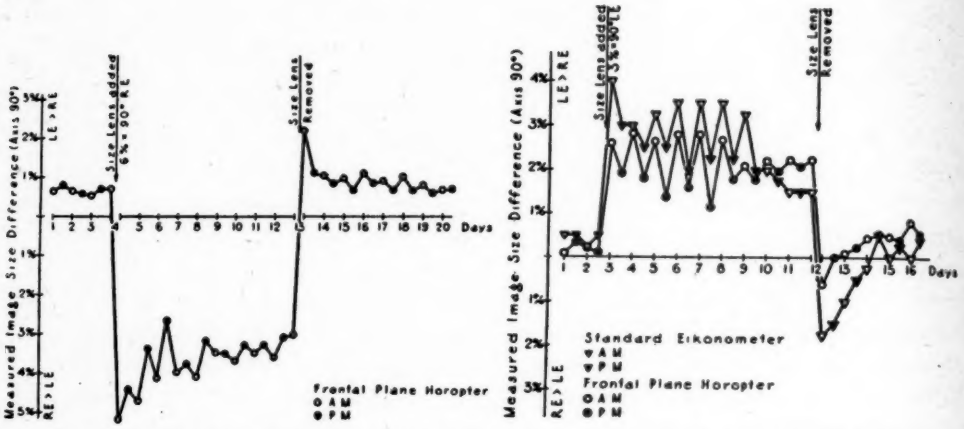


Fig. 1 (Burian and Ogle). Graphs showing measured image-size differences from day to day, in experiments on the prolonged wearing of size lenses.*

* Reproduced by permission of the Archives of Ophthalmology, in which this figure originally appeared (1943, v. 30, pp. 652 and 658).

no compensation for the artificial image-size difference, even after having completely overcome the incorrect orientation caused by the size lens.

These results gave evidence that while the subjects could and did become adapted for the distortion of space in normal surroundings produced by an artificial size difference, the image-size difference itself was not, or was only partially compensated for, regardless of how long the size lens was worn. On the other hand, in surroundings where familiar uniocular clues were present, the incorrect spatial localization that should accompany such an image-size difference disappeared in a short while, but did become immediately manifest in environments where these uniocular clues were absent. There was, in other words, in some surroundings a suppression of the stereoscopic clues to depth perception under the influence of the uniocular clues which became dominant.

The spatial effect of artificial meridional aniseikonia introduced in the horizontal meridian can thus remain latent so long as there are sufficient uniocular clues in the surroundings to offset the incorrect stereoscopic perception. The relative "weight" given to the two sets of visual factors varies with the subject, some subjects being highly responsive to the stereoscopic stimuli, whereas others appear more dependent upon uniocular clues for their spatial orientation.

II

The second investigation[7] that forms the basis of this discussion follows logically from the first, for if the image-size difference introduced by a size lens at axis 90° cannot be entirely compensated for, aniseikonic patients might be expected to show some latent incorrect spatial localization. If such is found to be the case then the incorrect spatial localization could be used to determine the type and to measure the amount of aniseikonia present in the clinical patient.

The problem was to devise a sensitive instrument that would be able to separate the different types of image-size difference and would contain a minimum of uniocular clues, so that the test would depend solely upon stereoscopic spatial localization. This problem was solved most ingeniously by A. Ames, Jr.,[9] and the test is now incorporated in the so-called space-eikonometer, an instrument that measures image-size differences through stereoscopic space perception. Comparative measurements of the aniseikonia of patients were obtained on both the standard eikonometer, which does not depend upon stereoscopic vision but upon the subject's discrimination of the actual angular disparity of the images of dissociated target patterns, and on the new space-eikonometer. The measurements were for image-size differences in the horizontal and vertical meridians only. A scatter diagram (fig. 2), obtained by plotting the comparative data of over 400 subjects,* clearly shows a tendency to cluster about a 45° line, and this indicates a good correlation. Statistical analysis shows the correlation to be high. About 70 percent of the measurements on the two instruments agree within 0.5 percent of image-size difference. This association is even more significant when the reliability of the standard eikonometer itself[10] is considered.

The results of this study are evidence that aniseikonic patients as they present themselves at the Clinic do have a latent incorrect binocular spatial localization that becomes manifest in the space-eikonometer, in which the localization of the test elements is based upon the binocular fac-

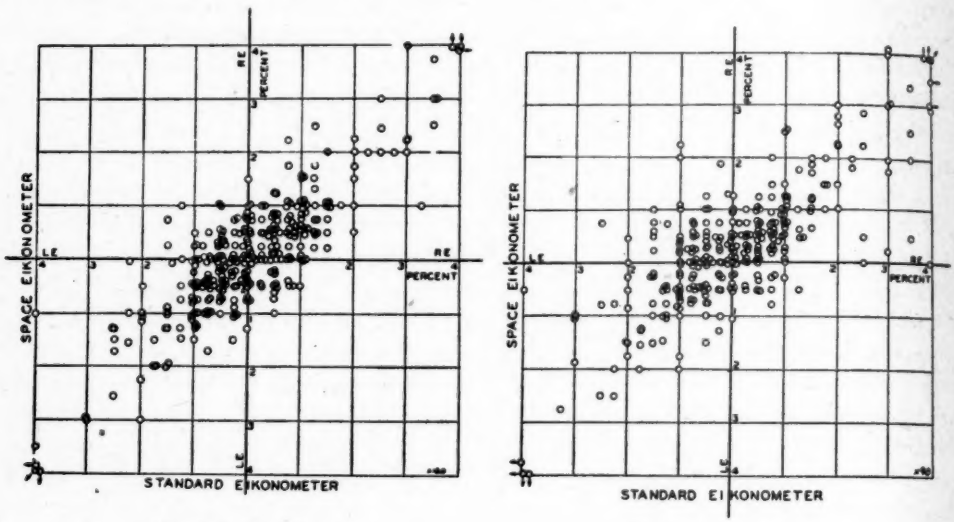
* These graphs are essentially figures 5 and 6 of the article quoted (cf. ref. 7), to which have been added the new data of nearly 300 subjects.

tors of spatial localization. Statistically, the type and degree of the incorrect binocular space perception are what may be expected from the type and degree of the aniseikonia as measured on the standard eikonometer.

III

The third investigation to be discussed now, deals with a similar statistical study of aniseikonia and incorrect binocular spatial localization.[8]

Astigmatism is a refractive (as distinguished from an axial) ametropia,[11] and its correction by an ophthalmic cylinder would introduce a meridional magnification (or diminution) of the retinal image. A meridional magnification, having an effect in one meridian only, produces an elongation and therefore a distortion of the image. Associated with that distortion are small rotary deviations of the images of all lines in space not parallel with or at right angles to the axis of the magnification. Thus, a meridional magnification at an oblique axis in one eye will introduce small rotary deviations of the images of all vertical lines; that is, it will introduce a vertical declination error between the images of the two eyes.[8,12] This error is functionally important, for when it exists in binocular vision, lines and surfaces in space will appear incorrectly inclined away or toward the observer. Moreover, objects will appear correspondingly distorted.



Vertical Meridian Horizontal Meridian

Fig. 2 (Burian and Ogle). Scatter representation of the comparative data of the aniseikonia measured upon the standard eikonometer and that measured upon the space-eikonometer.

Thus, astigmatism at oblique axes when corrected by ophthalmic lenses, optically should introduce vertical declination errors which, in turn, should result in an incorrect inclination of binocularly seen lines and surfaces. If the degree and axis of astigmatism, as well as the physical dimensions of the correcting lenses and their distances from the eyes are known, it is possible to calculate fairly accurately the theoretical vertical declination error caused by that astigmatism. The space-eikonometer is designed to measure also the amount of the binocular spatial distortion that would be produced by vertical declination errors. Such measurements

were obtained on a comparatively large number of patients (309) with astigmatism at oblique axes, a majority of whom had worn proper corrections for a long time. These data were then compared with the calculated values. The scatter diagram (fig. 3) illustrating these comparative data clearly shows a statistical correlation.

These results give evidence that a large proportion (74 percent) of patients with astigmatism at oblique axes show, under test conditions, an incorrect binocular spatial orientation in the direction indicated by the amount and degree of the astigmatism at oblique axes. The majority of the patients tested were, however, not aware of incorrect space perception in ordinary surroundings. But it became evident in the space-eikonometer, where uniocular clues to spatial orientation are kept at a minimum. This result also suggests that for a large percentage of cases in which astigmatism at oblique axes has been corrected, there is not a complete compensation for the aniseikonic error introduced, although most subjects do not notice an incorrect binocular spatial orientation in ordinary surroundings.

Comment

The evidence presented in the preceding pages can be summarized as follows.

The subjective disorientation of objects in space caused by an aniseikonia created artificially by placing a meridional size lens before one eye, gradually disappears in normal surroundings when the lens is worn continuously over a period of time. However, the greater part of the image-size difference is not compensated for and it can be measured on instruments in which uniocular clues to spatial localization have been reduced to a minimum.

Statistically, patients with meridional aniseikonia in the principal meridians as well as at oblique meridians show, under test conditions, an incorrect spatial localization. This incorrect localization can be used to determine the type and to measure the amount of aniseikonia present. Generally, the patient with aniseikonia is not aware of a distortion of objects in his surroundings.

These results help us to understand how patients with aniseikonia deal with

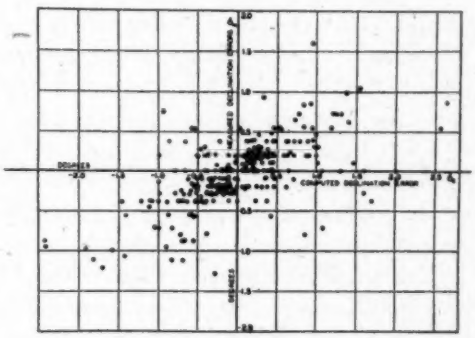


Fig. 3 (Burian and Ogle). A scatter representation of the measured and calculated data for the declination errors associated with astigmatism at oblique axes. The empirical data were determined on the space-eikonometer.*

the problem of incorrect spatial orientation. They explain, on the one hand, why the majority of the aniseikonic patients do not report a disturbance in space perception, though some occasionally recall instances of difficulty when this possibility is brought to their attention. A few exceptional patients report spontaneously a spatial distortion. On the other hand, the foregoing findings demonstrate clearly that the mere fact that a patient has become accustomed to a new pair of glasses which at first caused spatial distortion, does not mean that the aniseikonia introduced by the correction has actually been overcome or compensated for, as has been claimed.[13]

This point is illustrated by the follow-

* Reproduced by permission of the Archives of Ophthalmology, in which this figure originally appeared (1945, v. 33, p. 124).

ing case: D. H. B., a college student aged 17 years, had not worn glasses for two years. Upon examination the following correction was prescribed: R.E. + 0.25D. sph. ⊂⊃ −1.00D. cyl. ax. 90°; L.E. +0.50D. sph. With this he had 20/20 vision in each eye. There was no significant muscle imbalance, and the stereoscopic vision was normal. When the patient put on the spectacles with the prescribed correction, he immediately reported that objects and surfaces appeared distorted. The distortion described was typical of an aniseikonia in which the image of the left eye was larger in the horizontal meridian (axis 90°). This type of aniseikonia would be anticipated on the basis of the anisometropia. Measurements on the space-eikonometer showed that he needed an aniseikonic correction of: R.E. 1% mag. overall ⊂⊃ 1.5% mag. axis 90°, to make the test elements appear correctly oriented.

The patient was asked to wear the refractive lenses constantly for a time during which he was to note the appearance and any change in the appearance of his surroundings. He returned for reëxamination at the end of a week, and reported that the distortion of objects had gradually decreased and that it had practically disappeared at the end of the third day. If he removed the spectacles, however, he immediately saw a distortion of his surroundings but in the direction opposite to the original distortion. The measurements on the space-eikonometer gave: R.E. 1% overall ⊂⊃ 2% axis 90°. Without the glasses no image-size difference was measurable within ±0.25 percent at axis 90° and ±0.5 percent at axis 180°.

The patient continued to wear the spectacles and returned again at the end of nine days. The measurement on the space-eikonometer at that time was R.E.: 0.5% overall ⊂⊃ 1.75% axis 90°. Further measurements could not be made because the patient left college for the Service.

This case shows clearly that whereas the spatial distortions caused by the new anisometropic correction disappeared almost entirely in ordinary surroundings, the image-size difference which gave rise to those distortions did not disappear.

In conclusion, the following may be stated about aniseikonia and spatial orientation. Meridional aniseikonia always entails some type of incorrect spatial localization. One cannot compensate for it, or, at best, for only a fraction. For the most part, the effects of aniseikonia on spatial orientation are not perceived, since everyday surroundings, as a rule, offer uniocular clues in such abundance that they dominate the binocular data and rectify the incorrect spatial relationship of objects that would result from the binocular data alone. Patients with meridional aniseikonia are, therefore, not generally aware of an incorrect spatial orientation. However, the latent incorrect spatial localization becomes immediately manifest in surroundings where uniocular data are absent. The faulty spatial orientation may sometimes appear in normal surroundings if the patient is fatigued or under emotional stress.

These facts suggest that the stimuli for an incorrect spatial localization are present constantly, and, even though the distortion is not apparent, they could nevertheless be a scource of conflict in space perception. The answer to the question, to what extent this conflict between two ever-present sets of visual clues may be the cause of the ocular discomfort experienced by so many patients with aniseikonia, is not within the scope of this paper.

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GLAUCOMA AND ESSENTIAL PROGRESSIVE ATROPHY OF THE IRIS

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During the 40 years since the first clear description of essential progressive atrophy of the iris by Harms[1] was published, only 47 instances of this condition have been reported. Its cause remains obscure, although the probable basis for the associated glaucoma has been indicated. A case with some interesting clinical features is therefore being reported.

CASE REPORT

A private, aged 21 years, was admitted to Barnes General Hospital on March 6, 1943. He had known of a deformity of the pupil of the right eye since 1936, when he consulted a physician because of a hordeolum. The appearance had not changed since that time. In January, 1943, blurring of the vision of that eye was noticed, particularly in the morning. It would usually clear up toward noon. There was no associated pain nor headache.

On examination the visual acuity was: R.E. 20/40, J4; L.E. 20/30, J1. The lids, cilia, lacrimal apparatus, and extraocular muscles were normal. The conjunctivas were pale.

Right eye: The cornea was 10 mm. in diameter. The corneal refraction was 42.5D. The cornea showed no evidence of inflammatory deposits, but definite endothelial bedewing was present; as a result, there was a slight amount of epithelial edema. At the 9-o'clock area a peripheral anterior synechia was visible. The anterior chamber was 2.86 mm. in depth.[2] No flare was visible in the aqueous. The pupil was irregular and drawn over toward the nasal limbus. The sphincter was intact and reacted promptly to light stimuli. The iris was light blue in color. From the sphincter area to the temporal limbus in a horizontally oval area, 6 mm. long and 2½ mm. wide, all layers of the iris were absent except for a few thin stromal strands which moved with changes in the size of the pupil. Below this area and parallel to it was an area of the same dimensions in which only the pigment epithelial layer remained. Some stromal atrophy was present at the upper and lower iris periphery. The lens capsule was transparent and had a few triangular pigment deposits at the area behind the pupil. The lens and vitreous were clear. The retina and its vessels were entirely normal. The intraocular pressure (Schiøtz) was 26.5 mm. of mercury.

Gonioscopy revealed that the rim of iris nasal to the pupil seemed more compact than the remaining iris. The iris peripherally was adherent to the trabecular wall of the chamber angle. Even where the iris was completely absent and the normal ciliary processes were visible, the trabecular wall was covered by the brown remnants of pigmented epithelium. At the 9-o'clock area the anterior synechia extended slightly onto the back of the cornea.

Left eye: The cornea was 11 mm. in diameter. The corneal refraction was 43D. in the 85-degree meridian and 42.5D. in the 175-degree meridian. No deposits nor edema was visible in its layers. The anterior chamber was 2.82 mm. in depth. No flare was visible in the aqueous. The pupil was 4 mm. in size, round, and reacted normally to light. The blue iris was normal in all its markings. The lens, vitreous, and optic disc were entirely normal. The retina and retinal vessels showed no abnormalities. The

visual fields were normal. The intraocular pressure was 15 mm. of mercury (Schiøtz).

Gonioscopy revealed some gray mesodermal network bridging portions of the angle recess with a large vessel at the 9-o'clock area. The trabecular wall appeared normal. Blood could be seen in Schlemm's canal.

Refraction (with 5-percent homatropine hydrobromide cycloplegia) revealed the following corrected visual acuity: R.E. 20/30, J2 with −0.75D. sph. ⌯ + 50D. cyl. ax. 15°; L.E. 20/20, J1 with + 0.62D. cyl. ax. 180°. The intraocular pressure following cycloplegia was R.E. 30 mm., and L.E. 15 mm. (Schiøtz).

The general physical examination revealed no abnormalities. Results of laboratory studies were as follows: erythrocytes 4,310,000 per cu. mm.; leukocytes 7,100, 20 percent of which were eosinophiles, 43 percent segmented polymorphonuclear cells, 34 per cent lymphocytes, and 3 percent monocytes. The blood hemoglobin was 83 percent. Urinalysis was negative. The blood Kahn test was negative. Fasting blood chemical analysis: Nonprotein nitrogen 25.9 mg. percent, sugar 100 mg. percent. A repeated eosinophile count revealed 31 percent blood eosinophiles. A stool examination and subsequent repeated examinations revealed ova of the hookworm (Necatur americanus). On April 5, 1943, treatment with 3 c.c. of tetrochlorethylene was instituted. Three subsequent stools were negative for ova. An examination two months later was negative. In 1929 or 1930 routine examination in school had first revealed the presence of hookworm eggs. Treatment was given at this time. Again in 1935 or 1936 a routine examination was positive for hookworm ova. No treatment had been given.

A diagnosis of essential progressive atrophy of the iris was made. The infestation was considered as probably coincidental but deserving investigation.

On the next three days the ocular tension was taken several times daily and remained at R.E. 26.5 mm. Hg, L.E. 15 mm. In spite of this the cornea of the right eye was edematous during the morning and cleared up during the forenoon. Pilocarpine nitrate, 2 percent, was used in the conjunctival sac of the right eye beginning March 9, 1943, four times daily. No change in ocular tension resulted. On March 10, 1943 the ocular tension was R.E. 35 mm. and L.E. 15 mm.

Fig. 1 (Sugar). Appearance of iris holes in an eye with essential atrophy of the iris.

On March 11, 1943, a cyclodialysis operation was performed under local anesthesia. The spatula was inserted below and nasally 5 mm. from the limbus and swept around temporally to cause a cyclodialysis from the 4:30- to 7:00-o'clock areas of the corneal circumference. No hyphemia resulted. The convalescence was uneventful. The ocular tension of the right eye remained at 16 to 19 mm. thereafter. Gonioscopy revealed an open cyclodialysis cleft. No elevation of tension nor change in appearance of the iris was found during a period of two years of follow-up.

Comment

Essential progressive atrophy of the iris is apparently a disease entity characterized by a slowly progressive atrophy of the iris tissue resulting in the formation of holes in the iris, and nearly always is associated with glaucoma. It usually starts with an eccentric position of the pupil. Ectropion of the pigment epithelium of the iris occurs, and gradually holes appear in the iris on the side opposite the eccentric pupil. Eventually peripheral anterior synechiae form, and the signs of glaucoma supervene.

The disease has been reported in 47 cases, the features of a few of which suggest the possibility of their being secondary to another condition, such as inflammation or hydrophthalmos. For this reason Henderson and Benedict[3] divided the 28 cases they reviewed (including their own case) into three groups. Group I included 12 cases observed prior to the onset of glaucoma. Group II included cases observed after the onset of glaucoma. In neither of these two groups was any etiologic factor found. In Group III were included those cases which might be considered other than those of essential progressive atrophy of the iris. In the first two groups the age of onset of the iris defect varied from 20 to 48 or 49 years, averaging about 30 years. In all but 2 of the 12 cases glaucoma eventually developed in from slightly less than 1 year to 8 years. Only 2 of the 12 patients were males.

Two problems arise in considering this disease; first, the cause of the iris atrophy, and, second, the cause of the glaucoma. Let us discuss the second problem first.

Anatomic studies have been made in late cases only, so that the only early evidence available is from gonioscopy. The chamber angle has been observed in only five reported cases, those of McKeown,[4] Post,[5] Scharf[6] (two patients), and my own. Troncoso examined McKeown's patient and reported: "The examination of the angle of the anterior chamber at this place [below] showed a wide anterior peripheral synechia, which is attached to the limbus rather forward, almost to the transparent edge of the cornea. This synechia is partial. On each side the angle is open, the brown band of the ciliary body being clearly observed. The canal of Schlemm is not apparent and merges with the white sclera. In the upper part of the angle the coloboma does not reach the scleral limbus. A narrow stump of the retinal layer of the iris remains. Behind it, the ciliary processes appear and show no evidence of inflammatory disease. On the nasal side of the coloboma there is also a narrow anterior peripheral synechia. Except for these synechiae the angle is open all around the limbus." Glaucoma was not present at the time of this examination. In Scharf's first case the angle was closed in the area of coloboma but free on each side of the coloboma. A synechia was present above, from the 10- to the 4-o'clock areas. The lower nasal quadrant was open. In this case no change was found 4½ years later when the ocular tension rose to 35 mm. of mercury (Schiøtz). In the second case with ocular tension between 33 and 40 mm. of mercury, the angle was blocked in the coloboma areas, but became normal away from these places. Marked pigment deposits were visible in Schlemm's zone. In Post's case with glaucoma the angle was obliterated. In my own case, a borderline case with early glaucoma, the angle was covered by peripheral anterior synechiae. It is important, in considering Scharf's cases, to distinguish between a normal angle and one in which only the

portion of the trabecula anterior to Schlemm's canal is visible, since this area is apparently not significant in the resorption of aqueous. The drawings in Scharf's article suggest that Schlemm's zone is really blocked in the areas considered by him to be normal.

In all the eyes examined after enucleation (Ellett,[7] Rochat and Mulder,[8] Licsko,[9] Feingold,[10] Rones,[11] Wood,[12] Bietti,[13] Bentzen and Leber,[14] and Ruby)[15] the angle was obliterated by a peripheral anterior synechia in every case. A hyaline membrane extended across the new angle and iris in the cases of Rochat and Mulder, Licsko, Feingold, and Rones (figure 7 in Rones's report).

Several theories have been advanced to explain the glaucoma. Feingold[10] suggested that the glaucoma was produced by irritating substances which were elaborated as a result of iris-tissue destruction. Kreiker[16] believed that cellular detritus from the iris-tissue disintegration occluded the chamber angle. Licsko[9] considered the glaucoma to be due partly to dissemination of pigment from the atrophic iris and partly to a decrease of the available surface area for resorption of intraocular fluid. Waite[17] believed the latter to be the cause of glaucoma. In Rochat and Mulder's[8] opinion the principal factor is the formation of peripheral anterior synechiae. The evidence of the microscopic examinations and most of the gonioscopic examinations tends to confirm Rochat and Mulder's theory.

The cause of the iris atrophy, similarly, has been explained in many ways. Feingold[10] believed it due to a congenital vascular disturbance of the smaller iris circle. The lack of involvement of the sphincter is against this view. Waite[17] held that the atrophy was the result of a mechanical stretching of the iris tissue, which causes a narrowing and occlusion of the radial arteries, producing a nutritional disturbance of the tissues in all portions other than that supplied by the lesser circle. Larsson[18] believed it to be a congenital anomaly. Kreiker suggested that a cytolytic process, normally operating in embryonic life, becomes active in adult life and attacks the normal iris tissue. Similarly de Schweinitz[19] believed the atrophy to be due to local abiotrophy. Von Grosz[20] attributed the atrophy to a hereditary feebleness of the iris of neurogenic character. Rochat and Mulder[8] considered the atrophy to be due to mechanical distension of the iris tissue on the side opposite the eccentrically situated pupil. Against this theory is the fact that many cases have been observed in which the pupil was drawn up for many years after a cataract extraction, but no hole formation in the iris resulted.

Several interesting facts were observed in a review of the cases described in the literature. One of these was the finding of almost complete destruction of the endothelial cells on the posterior corneal surface in Griscom's[21] case. A similar involvement of the endothelium was present in my case. This resulted in corneal edema which was most prominent in the morning, without relation to the intraocular pressure. Another observation was the presence of a yellow spot on the iris in Stieren's[22] case, and in two cases (Rochat and Mulder;[8] Henderson and Benedict[3]) the microscopic evidence that the iris tissue was more compact between the pupil and the limbus where it was drawn toward the limbus. This was present clinically in my own case. In Rochat and Mulder's case "the tissue of the iris firmly attached to the cornea in the angle of the anterior chamber was not rarefied as in other parts but, on the contrary, was more compact. A new tissue had formed in the angle of the anterior chamber

containing many oblong cells with their nuclei parallel to the layers of the cornea. This accumulation of cells was in some spots so abundant that it almost resembled a small sarcoma of the iris root."

Summary

A case of progressive atrophy of the iris with increased intraocular pressure is reported. The presence of endothelial involvement and increased density of the iris at the area toward which the pupil was drawn were observed. The presence of increased intraocular pressure was explained by the dense peripheral anterior synechiae. No attempt is made at present to explain the cause of the iris atrophy.

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OBSERVATIONS ON RETINAL BLOOD FLOW WITH THE AID OF KUKÁN'S OPHTHALMODYNAMOMETER*

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Measurements of intraocular vascular pressures have been made by means of Kukán's ophthalmodynamometer,[1, 2] the essential feature of which is a suction cup, 11 to 13 mm. in diameter, for application to the scleral surface of the (human) eyeball, with connections to a vacuum manometer for registering the amount of reduced pressure applied to the globe. We have used this apparatus with cups of various sizes, ranging from 5 to 10 mm. in diameter, on the eyes of cats under nembutal anesthesia. When the fundus is viewed through an ophthalmoscope, gradual lowering of the pressure in the cup results first in a slowing of the blood flow in the retinal veins. With further decrease in pressure the blood flow slows in the arteries. Soon the blood cells appear as separate clumps, first in the veins, then in the arteries. The flow now stops in the arteries, then actually reverses its direction. Finally the veins become empty, collapse, and can no longer be seen, and the arteries in their turn disappear. The following typical record shows the various pressures at which the more striking of these changes were observed in one of our experiments:

420 mm. Hg—blood slowed in veins
390 mm. Hg—blood slowed in arteries
360 mm. Hg—blood separates in clumps in veins
220 mm. Hg—blood separates in arteries and flow begins to reverse
200 mm. Hg—collapse of veins and arteries

The exact interpretation of these results is still in doubt. Linksz[2] in his analysis of the physical principles involved in the use of Kukán's cup states that intraocular pressure is increased by suction applied to a portion of the outer surface of the eyeball; but because a small amount of fluid is squeezed out of the eyeball the increase in intraocular pressure is not directly proportional to the reduced pressure in the suction cup. The intraocular pressure and the subatmospheric pressure exerted on the eyeball do, however, have a fairly linear relationship within certain limits, so that all that is necessary for practical purposes is the use of a factor for one to be able to read intraocular pressures directly from the Kukán ophthalmodynamometer.

On the other hand von Dubois and Tischer[3] claim that application of Kukán's cup to the rabbit's eye produces no change in intraocular pressure as measured by a Verhoeff manometer, but only a decrease in extra- and intraocular venous pressures, an increase in bulbar volume, and an increase in rigidity of the bulbar wall. According to these investigators the only method for raising intraocular pressure is the application of suction to the whole orbit and its neighboring parts.

We agree with Linksz that application of the Kukán cup does increase intraocular pressure. This was measured in our experiments by direct cannulation of the aqueous humor through the cornea. When the pressure in the cup was lowered to some 200 mm. Hg, the intraocular

* From the Division of Physiology, University of California Medical School. Aided by a grant from the Research Board of the University of California.

pressure was increased by 17 to 20 mm. Hg, giving a factor of 0.1.[2]

Our use of the Kukán cup was as an aid in exploring the functions of the long ciliary nerves in relation to the blood supply of the eyeball.

Suction was applied to the eyeball of the nembutalized cat just sufficient to stop the blood flow in both arteries and veins of the retina. While this degree of suction was maintained, the cervical sympathetic nerve was stimulated. After a very short latent period blood began to appear in clumps in arteries, then in veins, and within a very few seconds blood was flowing through the retinal vessels in a steady stream. This observation could be repeated on the same preparation an indefinite number of times provided a rest of at least 10 minutes was allowed between trials.

The same result was obtained on stimulation of the cervical sympathetic when the group of either short or long ciliary nerves was cut, or both groups together.

The same result was obtained on stimulation of the central stump of any one of the long ciliary nerves when all four long ciliary nerves had been cut.

It seems logical to conclude that the return of circulation in the empty and collapsed retinal blood vessels through stimulation of the cervical sympathetic is the result of generalized increase in blood pressure in the whole head region. Even if nerve impulses passing from the cervical sympathetic out over the long ciliary nerves might possibly under normal circumstances have resulted in vasodilatation, this effect would have been nullified by the increased intraocular pressure which would have kept the dilated vessels collapsed and empty. Furthermore, circulation was observed to return when all the ciliary nerves, both short and long, were cut. This is experimental proof that the reopening of the collapsed vessels could not have been the result of stimulation of vasomotor fibers within the eyeball. The effect must come from outside the eyeball. It would seem that the return of circulation on stimulation of the central ends of the cut long ciliary nerves is to be explained as the result of stimulation of sensory fibers which reflexly increase the blood pressure in the head region around the eye. These fibers are undoubtedly sensory fibers of the trigeminal nerve which are known to travel in the long ciliary nerves.

Summary

1. Application of Kukán's cup to the eye of the cat under nembutal increases intraocular pressure sufficiently to stop blood flow in the retinal vessels.

2. Stimulation of the cervical sympathetic increases the blood flow in the retinal vessels, probably because of increased blood pressure outside the eyeball.

3. Sensory fibers in the long ciliary nerves can reflexly increase the blood flow in retinal vessels evidently by this same mechanism, since the effect is produced when both long and short ciliary nerves are cut.

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RECURRENT JUVENILE PAPILLOMA OF THE CONJUNCTIVA*

A CASE REPORT

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A unique conjunctival condition is presented, for which the patient was treated for more than five years before a cure was achieved.

The subject of recurrent papilloma of the conjunctiva may be thought of in terms of juvenile ectodermal outgrowths, inasmuch as the tumor is made up of young epithelial cells and involves only the most superficial epithelium. Juvenile papillomata of the conjunctiva are rare; I have observed only one during my medical career. The growth was superficial, multiple growths appearing evidently by contact infection or contact implantation, movable with the conjunctiva, and with a tendency to recur, whether partially or completely removed.

CASE REPORT

Baby J. R., white, aged three months, had light reddish hair, blue eyes, and was well developed and nourished. There had been epiphora of the right eye since the age of three weeks. The mother and father were living and well, as were two sisters, both of whom were myopic. The father and all three children had red hair; mother was blond. All had very thin skins which sunburned easily, but no member of the family had ever been treated for any skin lesions.

The eyelids, conjunctiva, and cornea were clear; the fundus was myopic. The inner angle of the right eye was filled with mucoid material. The left eye was normal.

I first saw this patient on account of epiphora of the right eye on March 10, 1935, at which time the lacrimal duct was probed and irrigated. The patient completely recovered from the epiphora but returned five months and three days after the first visit, with a small raspberrylike mass at the opening of the lower punctum. Under ether anesthesia the mass was dissected away, but was found to involve the mucous membrane of the canaliculus. The portion inside the canaliculus was cauterized with a heated lacrimal probe. The growth quickly recurred and was found to have attached itself to the bulbar conjunctiva and caruncle as well as to the edges of the upper and lower lids. The tumor was removed by dissection on September 27, 1935, and again on October 27, 1935, just one month after the previous operation, and again on the following dates: June 20, 1936; October 22, 1937; July 7, 1938; October 14, 1938; January 23, 1939, and April 10, 1939.

After having removed this tumor by dissection nine times, the papilloma was again observed at the lower punctum of the right eye, spreading to the inner angle, associated with the caruncle and plica, and in the fornices. Still later it spread in considerable numbers over the entire mucous membrane of the lids and bulb. This growth was superficial, never penetrating through the basement membrane of the conjunctiva. It was movable with the conjunctiva and easily removed by light dissection with very sharp iris scissors.

On March 1, 4, and 8, 1939, the patient was given 100 r units of X ray over the papillomatous areas; that is, 300 r units

* Read before the Academy of Ophthalmology and Otolaryngology of Harris County, Texas.

in all. There was no visible improvement and the tumor recurred as it had done previously.

On May 1, 1939, and again on June 1, 1939, the tumor was removed by dissection and radium was applied. There was no appreciable difference in the amount of improvement noticed after the use of X ray or radium, in conjunction with careful dissection, and after dissection alone. The use of radium and X ray was definitely and permanently abandoned, since, following irradiation, the patient suffered a severe conjunctival reaction, evidenced by loss of lashes of the upper lid.

The tumor continued to recur in much the same manner as before, attaching itself to the bulbar conjunctiva, caruncle, fornices, and lid margins. It was removed by dissection on September 7, 1939, and again on March 11, 1940. At this time 1 gr. of sulfanilamide per pound of body weight for three days was prescribed to be repeated after an interval of two weeks. The tumor was removed by dissection on August 31, 1940, for the fourteenth and last time. It has not recurred since. The sulfanilamide was to be continued as noted for six months after the last operation. This completed five years of continuous observation and treatment.

A check-up on October 5, 1942, revealed the patient's vision O.S. and O.D. to be 20/200.

EXAMINATION. *Right eye:* A few cilia were missing from the inner angle of the upper lid. The mucous membrane over the tarsus of the upper lid showed a first-degree cicatrix. No adhesions were to be seen. The conjunctiva, where dissection alone had been done or in combination with superficial cautery, showed no evidence of a scar. The punctum was wide open, and no evidence of the tumor could be seen. The cornea was clear; the lens showed some peripheral changes in the subcapsular epithelium and lens fibers; the media were clear and the fundus normal except for myopia. *Left eye:* The lids, conjunctiva, and fundus were normal, the media and lens clear.

The following lens prescription was required for vision of 20/40 in each eye: O.D. -3.00D. sph. $\bigcirc\!\!\!=$ $-.75$D. cyl. ax. 180°; O.S. -3.00D. sph. $\bigcirc\!\!\!=$ $-.50$D. cyl. ax. 180°.

During observation of this patient several biopsy specimens were taken. One was reported upon by Dr. L. A. Myers, as follows: "Sections show a biopsy specimen about one-half the size of a pea, composed of orderly folds, trabeculae and fingerlike projections of thick strata of squamous epithelium arranged on variable-sized cones of connective tissue. The cells show considerable activity or hyperplasia. The degree of differentiation is sufficient definitely to indicate a benign condition. Impression: Benign papilloma."

A biopsy specimen reported upon by Dr. Violet Keiller is as follows: "Microscopic epithelial papilloma of villous type. The flat epithelium composing it is very active but is not now malignant."

In some of the cases reported in the literature as papilloma, the microscopic findings and the names of the pathologists who interpreted them were not quoted. Wolff ("The pathology of the eye," 1934, p. 35) describes papilloma of the conjunctiva as pedunculated or sessile, the pedunculated types being confined to the bulbar conjunctiva and the sessile to the limbus and the cornea. "The centre, or mesodermal core, of the tumor, consists of connective tissue, vessels, and dilated lymphatics." Papillomata are new formations upon the surface without downward extension. They ". . . arise most frequently around the caruncle and upper fornix, but may occur anywhere on the

conjunctiva. They may be multiple and cover a large area." These tumors are potentially malignant.

Papillomata must be differentiated, in diagnosis, from epibulbar carcinoma, epibulbar sarcoma, simple granuloma, polyp, angioma, cyst, lipoma, dermoid, precancerous melanosis, and diffuse malignant melanoma. The relative amount of epithelium, blood vessels, and fibrous tissue determines the classification. The typical papilloma is soft, red, and pedunculated, with delicate fingerlike processes. Its surface is like that of a raspberry or cauliflower. Most of the tissue is epithelium, but some fibrous tissue and hyperplasia of the subepithelium are present.

In making a diagnosis of papillomatosis of the conjunctiva a careful history as well as careful inspection of the growth under good illumination and lens magnification is imperative. Certain malignancies are prone to become more active when disturbed surgically, therefore a biopsy specimen should be sent to the laboratory and the microscopic diagnosis made while the patient is upon the operating table.

Trauma, such as from instrumentation and rubbing of the eye by the patient, may contribute to recurrence. Dietary, endocrine, allergic, and chronic inflammatory conditions must also be considered as primary etiologic factors.

In treatment the most effective procedure for removal is dissection, it being understood that in benign papilloma it is neither necessary nor advisable to take deep, wide sections of the conjunctiva beneath the growth, because the basement membrane of the conjunctiva is not invaded. High-frequency current or Shahan's thermophore may be satisfactorily used. X ray and radium did not prove to be of any benefit in the present case, but if it is used the eye must be shielded by a thin leaden plate, molded to fit the globe. Local instillations of vitamin-A concentrate and estrogenic hormone in oil into the conjunctival sac may be of great benefit. Since riboflavin (vitamin B_2 or G) in certain selected cases will cause pannus and other avascularizations of the cornea and limbus to disappear, this should be tried, together with large doses of vitamin A. Vitamin B_1 should also be given in large doses in order to arrest any nervous symptoms and to stimulate the appetite. The eye should be kept clean with mild astringents and irrigations of 2-percent boracic-acid solution. Estrogens have a definite developmental effect upon juvenile epithelium, briefly converting it into adult type, with a markedly increased resistance to infection; therefore, the follicular hormone may be given intramuscularly. This was not done in the present case since I had had no experience with it in eye conditions and because the child's parents wanted assurance that the administration of the drug would not produce early sexual development.

Considerable time should be allowed for spontaneous recovery, since infantile papillomatous tissue found in the larynx and elsewhere in the body tends to stop growing at about the time of puberty.

From the history in the literature, papillomata may not be innocent growths. A number of cases have been reported by reliable authors to prove conclusively that they are capable of malignant degeneration. These tumors occur most frequently at the inner canthus and the corneoscleral margin, rarely on the cornea.

These growths are best removed surgically, and if X ray or radium is used every precaution should be taken to protect the lens since, according to Wolff, "Cataract may be produced by ultraviolet light, X ray and radium acting directly upon the subcapsular epithelium or ciliary epithelium and on the lens fibres." A biopsy specimen should be taken from

all papillomata and careful microscopic studies made. Papillomata should be completely removed by superficial surgery or high-frequency current, care being taken to remove no large pieces of conjunctiva, and, thus obviating the necessity of later correcting cicatricial defects by plastic surgery.

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NOTES, CASES, INSTRUMENTS

FOREIGN BODY IN THE LACRIMAL SAC*

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No case of foreign body in the lacrimal sac has been found in the literature.

CASE REPORT

K. R., a white female, aged seven months, was first seen on August 14, 1944, because of an epiphora and mucopurulent discharge from the left eye since birth. The right eye had been normal. The patient was one of twins, and the twin had no ocular trouble.

Examination. The results were normal except for the condition of the left eye.

Left eye. There was marked epiphora with moderate mucopurulent discharge expressed from the lacrimal sac, and free in the conjunctival sac. The puncta were patent and the globe entirely normal. A stenosis at the lower end of the lacrimal sac was diagnosed.

Treatment and Follow-up. Massage over the left lacrimal sac followed by boric-acid irrigations three times a day was advised, but after two weeks there was no improvement. On August 31st, under ethyl-chloride anesthesia, a probing was undertaken, with the use of a No. 1 sterling-silver olive tipped probe that had been bent about 1 cm. from its end and straightened. This probe had been in use about 10 months. The lower punctum was dilated, the probe introduced and guided to the sac. On making the right angle turn at the sac, the probe was felt to "give" and was withdrawn. It was immediately apparent that the distal 6 to 8 mm. of the probe were missing. Attempts to massage the canaliculus, and to irrigate through the upper punctum while compressing the lower end of the lacrimal sac, were not successful in removing the piece of probe. On further probing, with sizes up to No. 4, the scraping against metal could be felt, but the broken probe remained in position. Finally, another No. 1 probe was passed into the sac through the occluded lower end of the sac into the nasolacrimal duct. The sac was irrigated freely, and the patient had no further epiphora nor discharge from this time.

X-ray examination on September 6th revealed a clean-cut metallic foreign body, about 8 mm. in length, lying horizontally at about the level of the inner canthal ligament (figs. 1 and 2). On September 7th, with the patient under ether anesthesia, the lower punctum was probed again and the feeling of metallic foreign body was still present in the distal end of the canaliculus. Further probing with larger probes seemed to push the foreign body into the sac, and no grating could be felt. X-ray examination immediately following the probing on September 7th

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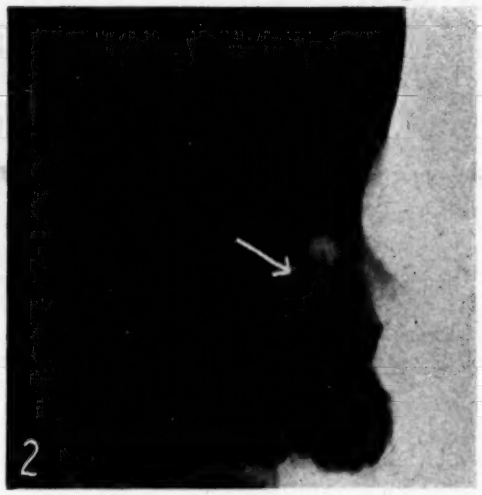
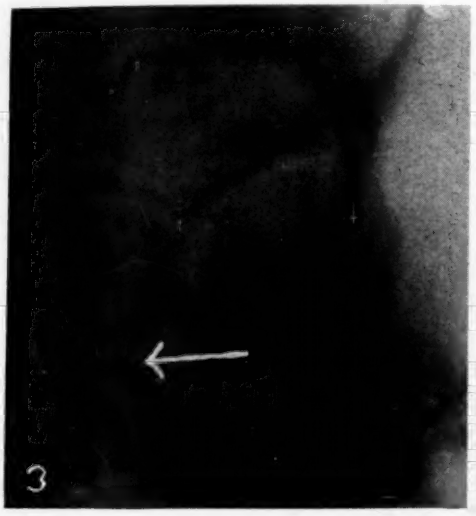
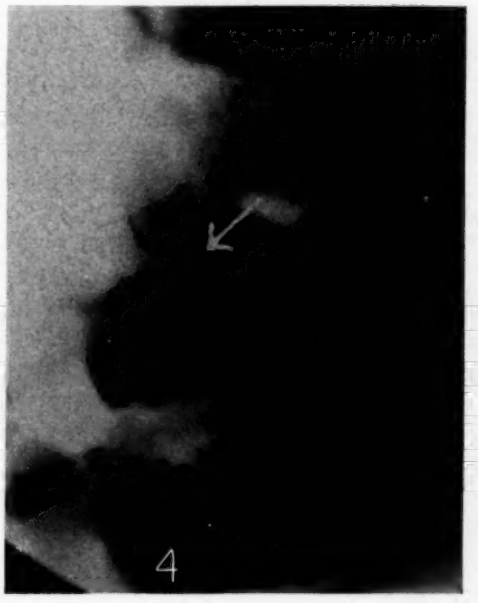
* Presented on December 2, 1944, before the 2d annual meeting of the Department of Ophthalmology, George Washington University, School of Medicine.



Figs. 1 and 2 (Costenbader). X-ray studies made on September 6, 1944, showing location of foreign body.





Figs. 3 and 4 (Costenbader). X rays taken on September 7, 1944, showing foreign body in the lacrimal sac of the left eye.

revealed an 8-mm. clean-cut foreign body lying vertically at about the level of the lower end of the lacrimal sac (figs. 3 and 4).

The parents were informed of the further progress of the foreign body, were assured that it would not be spontaneously extruded, and advised that it would have to be removed through incision of the lacrimal sac. The day before the patient had been scheduled for removal of the foreign body (September 19th), further X-ray studies were made and revealed no foreign body present, on three views. The foreign body had not been observed by the parents in the nasal secretion, or elsewhere and could not be accounted for. To make doubly certain, further X-ray studies were made on November 3d, but no evidence of foreign body could be found. The patient continued to be free from epiphora and dis-

charge, and was physically unharmed by her unfortunate experience.

Comment

A case of foreign body of the lacrimal sac has been presented with two things in mind: 1. The ordinary lacrimal probes can and will break, and in this case a portion did remain in the lacrimal sac for a period of time. 2. The nasolacrimal duct is apparently large enough in many individuals to extrude spontaneously the olive tip of a No. 1 lacrimal probe.

1150 Connecticut Avenue, N.W. (6).

SOCIETY PROCEEDINGS

Edited by Donald J. Lyle

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

February 8, 1944

Dr. T. F. Leatherwood, *presiding*

An unusual case of glaucoma

Dr. Phil Lewis again presented B. C., a colored man, aged 74 years, whom he had shown at the last meeting.

A recent trephining operation on his poorer eye lowered the tension from 50 mm. to 25 mm., but there was no improvement in central vision or visual fields. Following the operation on the left eye, the tension of the right eye, which before could not be reduced below 40 mm. by various miotics, was remaining under 30 mm., with the same dosage of drugs. Other interesting and unusual features in this case were the concentric contraction of the fields to 10 degrees and the lack of cupping of the discs. The only positive finding on general, neurologic, and laboratory examination was an arteriosclerosis of moderate degree.

Myasthenia gravis

Dr. Ralph O. Rychener reported a case of myasthenia gravis in an auto mechanic, aged 43 years, who had suffered from double vision for seven weeks. During this interval he had many physical examinations which revealed nothing of importance.

On November 3, 1943, there was almost complete ptosis of the upper lid of the left eye. The palpebral fissure measured 3 mm., and the patient was unable to raise the lid above this point.

There was vertical diplopia, indicating a paresis of the superior oblique muscle of the left eye. After intramuscular injection of 0.5 c.c. prostigmin methylsulfate 1:2,000, the left palpebral fissure opened to 7 mm. without effort, and the patient stated that his eye felt much improved. He was placed on oral therapy of prostigmin bromide 15 mg. t.i.d., and reported in a month with complete recovery of the ptosis and elimination of diplopia except in the extreme inferior field on the right side. Here it was possible to fuse the images by effort. He had returned to his work and was carrying on in a normal fashion. Treatment was continued.

Ocular sensitivity to sulfathiazole

Dr. J. Wesley McKinney reported that L. T., aged 19 years, gave a history of frequent styes and redness of the eyelids for several months. There were a mild conjunctivitis and marginal blepharitis, for which sulfathiazole ointment had been given.

She returned in one month, having used the ointment intermittently during that time, mainly in the right eye, since the left eye had not caused any difficulty. She stated that for the past several days the right eye had been red and sore. The bulbar and palpebral conjunctiva was markedly injected. There were several staining ulcers astride the limbus below with surrounding hypertrophy resembling that of the limbal type of vernal catarrh.

The sulfathiazole was stopped and adrenalin drops given. The eye responded rapidly and was soon entirely white. About two weeks later the patient again had some burning of the right eye and used some of the sulfathiazole ointment. This resulted in a violent conjunctival reaction which lasted two days.

In the hope that her sensitivity was due only to the sulfathiazole a sulfanilamide ointment having the same base was used. There was no reaction from this, and the blepharitis finally cleared up entirely.

Lymphoma of the orbit

Dr. J. Wesley McKinney reported the case of Mrs. R. L., aged 49 years, who was seen in January, 1942.

The upper lid of the left eye had been swollen for several weeks and was slightly red. The vision was normal in each eye with correction. The eyes were internally normal. Both upper and lower lids of the left eye were full, but no masses were palpable. There was a dusky-red mass beneath the conjunctiva in the lower fornix and extending around to the nasal portion of the upper fornix. The mass appreciably elevated the fornix over its entire extent. Two small vegetations below the lower punctum were separate from the main mass. There was no exophthalmos.

General examination including blood study was negative. A small piece of the mass was excised for biopsy. Under the microscope, the tumor consisted entirely of lymphocytes with little or no supporting tissue and no evidence of malignancy. The pathologic diagnosis was lymphoma. The patient was given X-ray therapy, which causeed gradual disappearance of the mass.

Exophthalmos

Dr. Robert Raskind (by invitation) reported that W. W., a Negro aged 24 years, was admitted to the John Gaston Hospital on August 26, 1943, after having sustained a craniocerebral trauma under unknown circumstances. Examination on admission revealed a temperature of 100° F., pulse 68, respiration 20, and blood pressure 142/98. The patient was irrational and somewhat restless. There was considerable chemosis of the lids of the left eye and surrounding tissues. There seemed to be no loss of motor power of the extremities, and the deep tendon reflexes were physiologic and bilaterally equal.

X-ray examination of the skull revealed a fracture of the left frontal bone. involving the left frontal sinus and the floor of the left anterior fossa. Examinations of blood and urine made on the day following admission, except for a leukocytosis of 15,300, were well within the limits of normal.

The day after admission, there was more edema of the conjunctiva of the left eye; the proptosis of the globe had increased, and some corneal desiccation was evident. Attempts at closing the lids with collodion seal met with failure. Accordingly, on September 3d, Dr. Phil Lewis performed a Wheeler tarsorrhaphy under local anesthesia to prevent a desiccation keratitis.

On August 30th the patient was found to have a right hemiparesis with hyper-

reflexia and Babinski, but no clonus. The motor portion of the fifth, seventh, and ninth cranial nerves was involved on the same side. The picture of mental confusion and delirium became worse and the patient required heavy sedation. There was no hypertension, bradycardia, or slowing of respiration. Auscultation of the cranium revealed no bruit.

Since the patient's neurologic signs were becoming slowly worse it was decided to explore the left anterior fossa. Accordingly, on September 4th, under pentothal, an osteoplastic flap was turned down in the left frontal region. A moderately large extradural hematoma was encountered and removed; no active arterial bleeding interfered with this removal. The fracture of the roof of the orbit was visualized. The structures in the region of the sella turcica were inspected; the internal carotid artery was visualized; no aneurysm was found. The frontal lobe itself was quite tense, and it did not seem feasible to attempt decompression or exploration of the orbit at this time.

The patient made a very prompt and uncomplicated recovery following operation. The mental status was markedly improved within 48 hours. The contralateral pyramidal-tract signs disappeared more slowly. The patient was discharged from the Hospital on the thirteenth postoperative day, improved. Although the lids were still closed, the left eye seemed to have receded somewhat. On October 1, 1943, Dr. Phil Lewis opened the lids of the left eye. The eye was found to be in good condition.

Comment. Unilateral exophthalmos following cranial trauma is not an unusual finding in a neurosurgical service of any size. The most common cause of this manifestation is a fistulous communication between the internal carotid artery and the cavernous sinus. An excellent review of the literature on this subject has been made by Meyer and Sugar. Additional case reports are provided by Cunningham and Daily and associates. These authors describe both the orbital and the intracranial pathology.

Occasionally, unilateral protrusion of the eyeball may be observed following trauma which produces luxation of the globe itself. This is more commonly seen as a birth injury and is described by Lloyd. The same author also mentions the presence of hematomas occurring between the bone of the orbital roof and the periosteum as another cause for proptosis. This condition is often associated with multiple petechial hemorrhages over the convexity of the cerebral hemisphere.

There are several methods of approach to the orbit and surrounding structures for decompression and exploration. The first has been described by Naffziger. It consists of a coronal skin incision with anterior reflection of the skin flap. Small bone flaps are then turned down in the frontal regions with their bases hinged on the temporal muscles. Dandy attacks the orbit through a small osteoplastic flap placed low in the frontal region, using the temporal muscle as a base. A type of decompression of the medial wall of the orbit (lamina papyracea of the ethmoid bone) carried out through the frontal sinus is described by Kister. This procedure is primarily for decompression and provides very little room for exploration. The first two methods also give an approach to the internal carotid artery and surrounding structures.

Pituitary disease resembling Lawrence-Moon syndrome

Dr. E. C. Ellett presented J. W., aged 14 years, who was seen in May, 1943. It had been noticed that he had recently been holding reading matter close to his eyes. He complained of some pain over his

eyes. The boy was overweight, suggesting the Lawrence-Moon syndrome, but there was no retinitis pigmentosa, mental deficiency, hypogenitalism, nor polydactylism.

The vision was 6/60 and J6 in each eye, unimproved with glasses. The optic nerves were atrophic. The visual field of the right eye showed a temporal defect, that of the left a moderate contraction with enlarged blind spots. The patient was referred for general physical and neurologic examination, and a diagnosis of pituitary disorder was made. Surgery was suggested but the patient did not return for two months, at which time the vision had failed completely. Operation was performed and the following observations were made: The brain was under markedly increased tension. The optic nerve of the right eye was compressed. A small portion of the cyst was visualized. When this was punctured a large amount of fluid escaped. A low right frontal flap was turned down according to Dandy's technique. The cyst was exposed and punctured. Two or three small bits of tissue were removed for biopsy. At the end of the procedure, there was a hole about 2 by 3 mm. in the cyst, from which some fluid was still draining. Routine closure was made. The sections were composed mainly of bundles of connective tissue with scattered small and elongated nuclei, surrounded by scanty cytoplasm. The nuclei were easy to identify as those of fibroblasts. In this connective tissue there was a single island of epithelial-like cells very poorly stained, which suggested (in view of the origin of the tumor) the chromophobe cells of the pituitary. Another part of the section revealed only calcified tissue.

Ocular injury

Dr. E. C. Ellett reported that C. J., a 15-year-old boy, was seen in July, 1928, the day after he had been injured by the explosion of a dynamite cap. There were multiple wounds of the legs, body, and face, and of both eyes. Small foreign bodies removed from the skin were nonmagnetic.

Examination of the left eye revealed a conjunctival wound, out from the cornea, which had been closed soon after the accident. Apparently there was a scleral wound beneath. The vitreous was occupied by hemorrhagic bands passing in from the site of the wound. The fundus was dimly seen, with hemorrhage below, and out from the macula was a white area with a dark center, and a typical Vossius ring was present. The vision was first tested some days later and was 20/25 with +1.50D. sph. Ten days after the injury the eye and orbit became inflamed, and the vitreous assumed a yellow look. A granuloma developed at the site of the scleral wound, and the vision was reduced to perception of moving objects. Pus escaped through the granuloma and the eye became shrunken. It was removed on October 18, 1928. The section of the eye did not show any foreign bodies.

Examination of the right eye revealed a wound in the cornea, 4 mm. in size, at the 12-o'clock position, and below this a narrow coloboma in the iris, probably a cut. The pupil dilated well, showing a superficial cloudiness of the lens in the coloboma, and a Vossius ring. The vitreous was cloudy, the fundus details were dim. The vision, when tested for the first time, was 20/40. A gray mass could be seen well forward in the vitreous at the 9-o'clock position.

Twelve years later, in August, 1940, the patient was seen again. The vision was reduced to 1/60 due to an opacity in the lens. Removal of the lens was advised, but the eye became sore in a few days and X-ray examination showed a foreign body in the eyeball. An acute

iritis developed which did not subside under treatment.

On September 24, 1940, a small yellow nodule was seen in the iris at the 9-o'clock position. The tension was normal. The eye continued to be irritated and on October 3d an iridectomy was performed, removing the nodule with a piece of the iris. A second small nodule appeared from behind the iris and was removed. The eyeball collapsed, following an escape of fluid vitreous, but its contour was restored by filling it with saline solution. The lens was not disturbed. An X-ray picture of the nodule that had been removed showed that it contained a metallic foreign body. On October 15th the vision was perception of fingers at 3 feet. The lens had become dislocated into the anterior chamber. The fundus was visible with +8.00D. sph. The vision was 6/60 with +11.00D. sph. On October 17th the lens had fallen into the vitreous. Two months later the vision was 6/18 with +12.00D. sph. The fundus was visible and the lens could be seen below.

The patient was seen again on January 29, 1944. The eye was white, the tension normal. The fundus was easily seen; there was a large coloboma. The vision with glasses was 6/9 and J4. The lens could be seen far below and it did not move with movements of the eye.

Blindness from pituitary disease

Dr. E. C. Ellett reported the case of M. A., aged 23 years, who was seen in October, 1943. He complained that his vision had been failing for three years, without apparent cause. He gave a history of some stomach trouble and kidney disease. The vision was R.E. 5/60; L.E. 5/20 (eccentric); it continued to diminish until in January, 1944, he was blind in both eyes. The optic nerves were atrophic. Neurologic examination showed nothing of significance, the spinal puncture was negative, and it was thought that surgery was not indicated. It was felt, however, that the X-ray study was suggestive and that the symptoms were sufficient to justify X-ray treatment of the pituitary region. As a result the vision in the left eye improved to 5/60. The right eye did not improve.

Tumor of the iris of uncertain nature

Dr. E. C. Ellett reported that J. L., aged 23 years, had been referred from one of the Army hospitals for an opinion in regard to a black growth on the iris of the right eye. This had been present as long as the patient could remember, and was seen in a photograph taken nine years ago. The growth was near the root of the iris, was about 4 mm. in diameter, and projected forward. It was very dark and apparently separated from the iris tissue. The eye was otherwise normal. The vision was 6/6. The tension was 18 mm. Hg (Schiøtz). The growth had previously been diagnosed sarcoma, and removal of the eye was advised. It did not appear to be of that nature, and the patient was advised not to have anything done.

COLORADO OPHTHALMOLOGICAL SOCIETY

February 19, 1944

Dr. C. A. Ringle, *president*

Clinical meeting

(Presented by the Eye, Ear, Nose, and Throat Section, Fitzsimons General Hospital, Denver, Colorado)

Quadrantanopsia following accident

Lt. Col. Robert A. Smith presented R. M. T., aged 19 years, who was injured in an automobile accident on December 8, 1943, following which he was unconscious

for eight days. No record was available to show the extent of the injury or the surgical procedure which followed. He was admitted to this Hospital on February 7, 1944. He complained of visual disturbance, defective hearing, and nervousness when in crowds.

Physical examination had been essentially negative except for exaggeration of the deep and superficial reflexes. A tentative diagnosis was made on his ward of psychoneurosis, anxiety state, posttraumatic.

The vision was R.E. 20/20; L.E. 20/20. The pupils were equal and reacted normally to light and accommodation. The fundi were normal. On examination a bilateral quadrantanopsia of the upper visual field on the left side was elicited. The lower margin of the quadrantanopsia was not perfectly straight and fell below the 180-degree meridian, which was somewhat suggestive of a cortical lesion.

The patient stated that following the accident, he had bleeding from both ears, and that he had noticed some hearing difficulty and a hyperacusis. The ear drums were healed and intact but appeared dull and showed some scarring. His audiometric loss was: right ear, 16 percent; left ear, 4.8 percent.

Neurosurgical consultation had not been made as yet. The diagnosis from the ophthalmologic standpoint was quadrantanopsia, upper left field, bilateral. The cause was undetermined.

Injury to nasolacrimal apparatus

Lt. Col. Robert A. Smith presented J. H. H., aged 22 years, who stated that he had had occlusion of the right nasolacrimal apparatus since 1935. He gave a history of having been hit on the right side of the nose by a wrench. The only evidence of the surgery which was performed was a small slit of the lower canaliculus of the right eye. In 1941 he experienced more trouble than usual, evidenced by marked epiphora and a chronically inflamed right eye.

He was transferred to this Hospital on February 4, 1944, and a diagnosis of chronic, nonsuppurative, severe dacryocystitis of the right eye was made. The cause was undetermined. On February 12th a dacryocystorhinostomy was performed under sodium pentothal anesthesia supplemented by local novocaine. On February 13th the tear sac was irrigated through the lower canaliculus, and the solution flowed freely into the nose. The next day the skin sutures were removed. The sac was again irrigated and this was repeated daily for the next few days.

Traumatic cataract

Lt. Col. Robert A. Smith presented H. A. S., aged 33 years, who was struck in the left eye by a flying particle from a booby trap on October 2, 1943. He was treated in an Army hospital immediately and was transferred to this Hospital on January 12, 1944.

The vision was R.E. 20/15; L.E. 6/200. There was a traumatic cataract, involving chiefly the anterior lens capsule; and there was an iridodialysis extending from about the 10- to the 12-o'clock position at the iris root. The iris opposite the iridodialysis was adherent to the anterior lens capsule by posterior synechiae, which would make surgical repair of the iridodialysis impracticable.

This case was presented for consideration of the advisability and method of procedure for cataract extraction.

Penetrating wound of the cornea

Lt. Col. Robert A. Smith presented F. H. S., aged 23 years, who gave a history of injury to the left eye on February 3, 1944, as he was attempting to make an imitation bomb out of a "dud,"

50-caliber bullet. When the cap exploded something struck him in the right eye, causing a penetrating injury which involved the cornea and sclera, at about the 4-o'clock position, with prolapse of the iris. The prolapsed iris was excised and the laceration covered with a conjunctival flap. He was given sulfanilamides and three intravenous injections of triple typhoid, the first two of 200,000,000 units each and a third one of 400,000,000 units.

On February 11th the eye became chemotic and painful, so the patient was transferred to this Hospital. On examination, the conjunctival flap covered the wound, and the entire conjunctiva was edematous. The cornea and anterior chamber were clear. There was an iridectomy opposite the wound and an iridodialysis from the wound to about the 7-o'clock position which had a free edge and was attached to the anterior lens capsule, almost across the middle of the lens. The patient was placed on salicylates and intermittent hot packs. Under this treatment the eye improved and the patient became more comfortable. On February 14th the suture holding the conjunctival flap was removed. The following day the eye was examined with the slitlamp, and the aqueous was clear.

Gunshot wound of the right eye

Lt. Col. Robert A. Smith presented H. S. R., aged 24 years. This patient was admitted to this Hospital on September 8, 1943. He reported that on August 31, 1943, when he was training some men at skeet shooting, he was accidentally shot. Two pellets struck him in the left hand and one in the right eye. He was taken to a hospital in Texas, where X-ray examination revealed an intraocular foreign body. Attempts to remove it with the electromagnet proved that the foreign body was nonmagnetic. He was treated with intravenous typhoid therapy and was placed under observation.

On September 8, 1943, he was transferred to this Hospital. Examination revealed a markedly inflamed right eye, with the port of entry of the foreign body at about the 4-o'clock position on the limbus. The lens was slightly cloudy, and the fundus could not be seen because of hemorrhage in the vitreous. The foreign body was a round shotgun pellet that was imbedded in the lens behind the iris at the 10-o'clock position. The vision R.E. was limited to light perception; L.E. 20/20. It was decided to attempt to save the eye, but lens extraction was considered inadvisable because of the vitreous hemorrhage.

The following day the lead pellet was removed under local anesthesia, and convalescence was slow but uneventful. The lens became distorted, and the iris had defects at both the port of entry and at the site of extraction, and was bound down by posterior synechiae around its entire pupillary border. Vision was limited to rather poor light perception, and the eyeball was soft. Heterochromia was present, but slitlamp studies showed that the aqueous was clear and the iris free of any nodules.

The case was presented to get the opinions on the possibility of sympathetic ophthalmitis at this late date or in the future.

Interesting anatomic problem

Major Meyers Deems reported the case of A. L. H., aged 26 years, who, on December 31, 1943, developed a fullness in his left ear. Four days later he awakened with a paralysis of the left side of the face and an eruption of the left ear canal and part of the concha.

He was transferred to this Hospital on January 8th, and on examination it was found that he had complete paralysis of

the left side of the face, and a herpetic eruption of the ear canal and a portion of the concha; he also complained of a dry eye.

A diagnosis of Hunt's syndrome was made, the pathology of which is a herpetic lesion involving the geniculate ganglion. The point of interest to the ophthalmologists was the dry eye and its cause. It is well known that a lesion of the seventh nerve, proximal to or involving the geniculate ganglion results in a dry eye, and that a lesion distal to the geniculate ganglion results in normal lacrimation.

What is not well understood is how the motor-secretory fibers reach the lacrimal gland from the seventh nerve. These fibers enter the seventh nerve with the pars intermedius and leave the seventh nerve at the geniculate ganglion, with the greater superficial petrosal nerve joining the vidian nerve in the region of the sphenopalatine ganglion. These motor-secretory fibers join the second division of the fifth nerve and proceed forward as a part of the zygomaticotemporal nerve. From this nerve, they proceed upward to join the lacrimal branch of the first division of the fifth nerve and, thence, to the lacrimal gland.

The patient's paralysis cleared up gradually and, with it, normal function of the lacrimal gland returned.

Episcleritis

Major Meyers Deems presented a soldier, aged 21 years, who reported to sick call December 27, 1943, and was then transferred to this Hospital. The patient stated that in March, 1940, he had been ill for five weeks with an undiagnosed fever. At about the end of the second week both eyes became reddened and painful and for several days he complained of double vision. No other ocular symptoms were mentioned and his vision was normal as far as he could remember. He stated that his vision upon induction was R.E. 20/20; L.E. 20/30. His eyes had remained reddened since the onset of his difficulty. His most constant complaints were a sense of scratching in his eyes, pain behind the eye, and mild photophobia and tearing. He stated that these symptoms were more pronounced in the left eye.

His past history was negative, with no symptoms of allergy or tuberculosis. Family history was negative.

In November, 1943, he suddenly noticed black spots floating before his eyes and his vision became cloudy.

On admission to the Hospital his vision was 20/50 in both eyes. The cornea, aqueous, and lens was clear in each eye. The vitreous was markedly cloudy, more in the right eye than the left. There were fine vitreous opacities in both eyes, and those in the right eye were larger and coarser. There was marked injection of the episcleral vessels bilaterally. The discs and fundi were normal. The tension was normal to palpation.

An unsuccessful search was made for foci of infection and 200,000,000 units of typhoid vaccine, given intravenously, did not clear up the episcleral injection. He was treated daily in the clinic with glycerine-fuchsin solution, applied topically, and zinc; the pupil was kept dilated with atropine. Smears of the conjunctiva were negative for eosinophilia and skin tests revealed nothing of significance.

Tuberculous chorioretinitis

Dr. George H. Stine presented the case of T. L., aged 20 years, who had been discharged from the Army after a year's treatment because of bilateral chorioretinitis of a moderately severe degree. The etiology was undetermined. The patient's father had died of pulmon-

ary tuberculosis at the age of 33 years, and three uncles were similarly afflicted.

Examination of the eyes prior to this time revealed healed, disseminated, markedly pigmented chorioretinitis in both eyes, with some involvement of the maculas. The right eye became reactivated in December, 1943. No positive physical findings were elicited.

When seen for the first time in January, 1944, the vision, with a moderate correction for myopia, was R.E. 0.9; L.E. 1.0. The anterior segments of the eyes were normal. The fundus of both eyes showed many small areas of atrophic, pigmented choroiditis, with considerable pigment in the macular areas. In the left eye there was a diffuse hemorrhage which was faintly seen around the nasal margin of the disc and which was apparently in the choroid. Since then exudate had developed at and adjacent to the upper nasal margin of the disc. The lesion resembled chorioretinitis juxtapapillaris. There was also a faint superficial choroidal hemorrhage in the upper portion of the fundus. The intracutaneous test with second-strength purified protein derivative (P.P.D.) gave a marked positive local reaction with some general reaction, consisting of fever and malaise, in the first 24 hours. No other signs of active tuberculosis were found, although X-ray studies showed evidence of healed hilus tuberculosis. The patient seemed otherwise in good health.

Treatment consisted of atropine and X-ray therapy, one-fourth to one-third SED at five weekly intervals, and minute, gradually increased, doses of O. T. once a week, heliotherapy, and bed rest, with only moderate exercise. The condition began to show signs of improvement.

Walter A. Ohmart,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

March 20, 1944

DR. VERNON M. LEECH, *president*

CLINICAL MEETING

(Presented by the staff of the Illinois Eye and Ear Infirmary)

GLIOMA OF THE RETINA

DR. E. F. KORTEMEIER presented the case of a girl, aged 17 years, who gave a history of increasing proptosis of the right eye of three years' duration preceded by gradual loss of vision. The right eye was blind, protruded about 15 mm., and the disc showed primary optic atrophy. X-ray examination of the orbit and optic foramen showed negative findings. The right orbit was explored through the temporal fornix and a spindle-shaped firm mass was found, surrounding the optic nerve and measuring 10 by 25 mm. The optic nerve was sectioned flush with the wall of the eyeball and the mass removed by blunt dissection. The histopathologic diagnosis was glioma of the optic nerve. There was no evidence of recurrence after eight months. The eye had fairly good motility and the retinal vessels were filled with blood.

COATS'S OR VON HIPPEL'S DISEASE?

DR. MORRIS PIES presented J. W., a 14-year-old boy, with a history of blurring of vision of the left eye for one week. Family and past history were noncontributory. The vision was R.E. 20/40, corrected; L.E. light perception with faulty projection. Both eyes showed normal anterior segments. The fundus of the right eye showed hazy disc margins with enlarged vessels on the disc. Below and temporally to the disc there were areas of preretinal scar tissue with vascularization loops. The vessels were also

enlarged nasally, leading into a reddish elevated lesion in the periphery. The fundus of the left eye showed a large retinal detachment, with no visible tear, but massive subretinal exudation sprinkled with cholesterol. Neurologic and complete laboratory examinations gave results within normal limits. The case was presented to illustrate the difficulty in establishing a diagnosis between Coats's and Von Hippel's disease.

Neoplasm of the Ciliary Body

Dr. M. A. Da Silva presented a man, aged 74 years, who complained of gradual loss of vision for six years, and for three years pain in the left eye, which had become more pronounced in the past month. The left eye showed a scar from a pterygium operation. A well-defined pigmented mass, globular in shape, arose from the angle of the anterior chamber from the 9- to the 3-o'clock position, and a deposit of pigment was present on the iris in the neighborhood of the tumor. On transillumination the area corresponding to the upper nasal quadrant of the ciliary body was opaque. Three millimeters from the limbus, at the 9- and the 12-o'clock positions, two well-defined pigment spots were noted on the sclera; the one at the 12-o'clock position corresponded to the exit of an anterior ciliary vein. The pupil did not react to light or accommodation. The lens showed a nuclear cataract; the fundus was not visible. The intraocular pressure was moderately elevated. General examination and routine laboratory tests were essentially negative.

Tumor of the Orbit

Dr. A. Perret presented a 15-year-old girl who complained of protrusion of the right eye of two weeks' duration, which had developed within 24 hours. At the age of eight years she had been struck on the right temple; exophthalmos of the right eye appeared in a few hours, but disappeared gradually in one month without any treatment. The left eye was normal. Vision of the right eye was 20/40. There was a suffusion of the lower lid. An orbital mass, giving the sensation of a pack of worms, was palpable through the nasal half of the lower lid, protruding from the orbit. The fundus was normal; its lower portion was 2 diopters more hyperopic than the upper. The veins were slightly tortuous and dilated.

There was a marked irreducible proptosis (13 mm.) with limitation of movements in every direction, and corresponding diplopia. The exophthalmos did not increase when the patient bent over. Auscultation was negative and X-ray studies of the orbit showed no deviation from normal.

The sudden onset suggested a hemangioma. The patient was referred to the Tumor Institute for a therapeutic test with irradiation. She had 14 sessions of irradiation treatment, and the eye receded 7 mm. Biopsy through the lower fornix was contemplated if the eyeball did not continue to recede.

Diabetic Retinopathy with Retinitis Proliferans

Dr. A. Perret presented a woman, aged 34 years, who complained of seeing spots and black veils before the eyes, associated with poor vision, for the past year and a half. Diabetes was discovered four years previously and had been treated very irregularly with insulin and diet. At the present time the vision was R.E. 11/200; L.E. 10/200. Both eyes showed some early sector-shaped lens opacities and perinuclear deposits. No loose pigment was present in the anterior chamber. The fundi showed vitreous hemorrhages, severe retinitis proliferans, and diabetic retinitis.

The blood pressure in the brachial artery was 160/110. The urine contained albumen, sugar, and acetone. The fasting blood sugar was 222 mg. The tuberculin reaction with P. P. D. was strongly positive.

Bilateral congenital colobomata

Dr. William Busby presented the case of C. S., a girl, aged 8½ years, who had been under observation at the Clinic since the age of four months. Family and past histories were non-contributory.

Examination showed a horizontal nystagmus of both eyes with greater amplitude in the left. Vision was R.E. 20/70; L.E. sufficient only to count fingers at 2 feet. The fundus of the right eye showed a deep depression in the lower part of the optic disc. The left eye presented a coloboma of the iris at the 6-o'clock position, a large bluish-white coloboma of the choroid, and a coloboma of the lower half of the optic disc. Visual fields were not obtainable.

Gummatous retinitis

Dr. David Horwitz presented M. S., a Negress, aged 38 years, with a history of blurring of vision of the right eye dating from 1920, at which time she had contracted syphilis. Visual acuity of the right eye had previously been improved by vigorous antisyphilitic treatment. The vision at this time was R.E. 20/200; L.E. 20/20. A large, slightly elevated white retinal infiltration was present slightly nasal to the disc of the right eye and there was evidence of anterior uveitis. There was no improvement under arsenical therapy, and a secondary glaucoma developed. The intraocular pressure fell to normal within one month. In the fundus there appeared a large yellowish lesion along the superior nasal vessels. Clinical impression was that of gummatous retinitis. After one month of treatment with 90 grains of potassium iodide daily, visual acuity improved to 20/40+4, and the lesion in the fundus had become well demarcated and quiescent. There was also complete subsidence of the anterior uveitis.

Fibroplasia

Dr. Beulah Cushman presented the case of Baby D., from the Clinic of Northwestern Unversity Medical School. This was a premature baby whose birth weight was 1 lb., 12 oz. She had been in the incubator for 11 weeks and had gained satisfactorily. She had had no ultraviolet treatments. When the baby went home the parents noticed that the eyes seemed small.

She was brought in for examination at the age of 5 months, weighing 13 pounds, with the history that the eyes followed light or looked toward an electric light. They had never been injected and there was no tearing.

On examination, the cornea of the right eye measured 8.0 mm. and appeared round; the anterior chamber was very shallow with the thin iris lying forward almost in contact with the cornea. The slightly irregular pupil was 3.0 mm. in size, and there was no reaction to light. No definite pupillary membrane could be discerned. The lens was clear, and an avascular grayish mass was visible behind the lens, with no free masses.

The cornea of the left eye was slightly larger, measuring 8.5 mm., and was round and transparent. The anterior chamber was slightly deeper. The pupil measured 3.0 mm., with no reaction to light. The lens was clear, and a grayish reflex, less extensive than that in the right eye, was seen posteriorly; it appeared to be a retinal fold. A red reflex was obtained in both eyes temporally. The condition was considered to be "fibroplasia," according to Dr. T. L. Terry's recent studies. The eye development seemed

to be that of about a 6½-months-old fetus.

Since the first examination the eyes have shown some changes with irregularity in the shape of the pupil and gradual overgrowth of the uveal pigment forming an ectropium uvea. At about five months of age the infant had begun to hold her fists over her eyes in a manner that seemed to indicate some irritation or light sensitivity.

Last October, Dr. Terry advised a trephining over the ciliary body of the right eye and this was done. The condition of the eye did not seem to change. The left eye remained the same.

The pathologic diagnosis was "fibroplasia," as described by Dr. Terry, who has stated that normal development of the eyes is interfered with by the premature birth. Mann has pointed out that an altered environment may cause the organizers or determinants of organs to produce their stimulus at the improper time. The mesodermal elements of the eye will develop since they are self-determining and their size is regulated by the presence of the optic vesicle.

Occlusion of the central retinal vein

Dr. Bertha A. Klien presented a paper on this subject which has appeared in this Journal (December, 1944).

Discussion. Dr. William A. Thomas said that from the standpoint of internal medicine one finds great similarity between occlusion of the central retinal vein and vascular occlusion elsewhere in the body; especially the cerebral and coronary vessels, since these three together constitute the main end arteries of importance.

Obstruction may occur from external pressure, such as tumors; however, this can be ignored, because the actual mechanism is within the vessel as the terminal incident of the external disease. External pressure results in occlusion from within, a process not strictly mechanical. Treatment would depend on the cause of the mechanism involved; therapy quite appropriate for one type of occlusion is entirely inadequate or useless in other types.

It must be borne in mind that thrombosis is not a clot. Clotting is a very complicated process occurring only in the higher vertebrates and requiring complete stasis of blood, and tissue or cellular injury. It is like the slow freezing of a pond with uniform distribution of all elements involving vitamin K, bile salts producing prothrombin, and calcium resulting in thrombin. Thrombin is controlled by a delicately adjusted balance between antithrombin and thrombokinase. With fibrinogen it produces fibrin. Thrombosis is to be compared to a snow bank, with the platelets as the flakes. The blood must be in motion. Stained platelets are small nuclear bodies. *In vivo* this nucleus is surrounded by a veillike cytoplasm with actively ameboid pseudopodia that are arrested by an irregularity of the surface and adhere to it and one another in ridges at right angles to the blood flow. The injured cells liberate thromboplastin, which forms a clot in the lumen extending to the lumen of the next larger vessel, where the blood stream is slowed. A thrombus is thus formed and this process may extend into parent vessels of ever-increasing size.

The causes of thrombosis are: (1) injury to the intima, which is traumatic; this is not important in the eye but is serious in the lower limbs and following surgery; (2) slowing of the blood stream; (3) change in chemical composition of the blood; (4) inflammation of walls, as tuberculous, and so forth. Slowing of the blood stream is very important with respect to anticoagulation therapy.

This may result from general conditions causing a low blood pressure. Thrombosis usually occurs at night. Hypothyroidism is frequently seen, as well as heart disease, causing a lowering of pulse pressure which is more important than the actual reading of the blood pressure. Shock, practically always surgical, is a common cause of cerebral thrombosis, and should be considered in connection with the retinal vessels. Hemoconcentration, increased blood viscosity, and decreased blood volume are all causes, since in any situation where the intima is touching, thrombosis will occur.

Hypertension, as such, is not important, since the disease is only in arterioles. But where vascular disease has occurred, with slowing of the venous blood flow and lowering of the venous pressure, thrombosis occurs as a stagnation phenomenon. When the large vessels only are sclerosed there is no hypertension, but nocturnal thrombosis is frequent.

Spasm of arterioles reduces flow in veins, especially in the spastic stage of hypertension. Thrombosis in arteriosclerosis and angiosclerosis is only the terminal event in the course of systemic disease, and anticoagulants are of no value.

Changes in chemical composition of the blood include numerous dyscrasias such as: (1) polycythemia vera, a defect of heparin production, which occurs in acute hepatic insufficiency; (2) an excess of vitamin K, occurring in inflammation of the liver with prothrombin levels of 150 or more; (3) increased platelet production and increased fragility of platelets. Calcium is not an important factor and thrombosis is not inhibited by withholding it or accelerated by administration of these salts.

Inflammatory conditions of the eye, such as thrombophlebitis, differ from general disease in most other portions of the body such as the pelvis, or lower extremities, where they are most frequently seen in general medicine. In these latter cases accessory circulation is present and there is no great tissue suffering from loss of circulation.

Thrombi may become infected, causing abscess or pyemia. If aseptic they may contract with reopening of the vein, may absorb, or may organize with entering blood vessels. If calcium salts are deposited, they form phleboliths. Anticoagulants, such as heparin and dicumerol, prevent agglutination of platelets and interfere with the union of prothrombin and calcium in the formation of thrombin. The use of anticoagulants is important in general medicine, especially in trauma, surgery, and so forth.

In cases of slowing of the blood stream, general measures such as thyroid, digitalis, and antispasmodics are used. These are especially valuable in the hypertensive spastic conditions where the use of cyanites, nitrites, and so forth, may result in longstanding suppression of spasm. In these cases anticoagulants are of extreme value. On the other hand, if extensive arterio- and angiosclerosis result in external pressure to the vein, or thrombosis therein is a terminal event in general systemic diseases, anticoagulants are of no value.

In chemical changes in composition of the blood that shorten coagulation time and increase prothrombin levels, heparin and vasodilators are obviously indicated, and no time need be spent in elaborating upon this phase.

In inflammatory conditions, anticoagulants are in most cases useless and dangerous. In the central retinal vein, where inflammation, especially tuberculosis, has occurred, there is a tendency to hemorrhage and thinning of the vessel wall. A thrombus partly supports the wall. This is

seen in the strengthening of an aneurysm of the aortic wall by a thrombus. Any interference is likely to result in profound hemorrhage, so that in the eye anticoagulation therapy will probably result in aggravation rather than improvement of the vascular condition.

THE STANDARDIZATION OF SO-CALLED SCHIØTZ TONOMETERS

DR. PETER C. KRONFELD presented a paper on this subject which has been published in this Journal (January, 1945).

Robert Von der Heydt.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

March 6, 1944

DR. SIGMUND A. AGATSTON, *presiding*

According to its annual custom, the March meeting of the New York Society for Clinical Ophthalmology was devoted to a round-table discussion of a single ophthalmologic subject, namely "Ocular injuries." The meeting was divided into two parts: (1) demonstrations related to the evening's subject and (2) a panel discussion wherein questions submitted several weeks before the meeting were edited and then divided among the four ophthalmologists comprising the panel. The four ophthalmologists were: Dr. Morris Davidson, Dr. Wendell L. Hughes, Dr. Edmund B. Spaeth, and Dr. Harvey E. Thorpe.

THE BERMAN LOCATOR

MR. SAMUEL BERMAN demonstrated the Berman locator and showed how it may be used by the ophthalmologists.

THE OPHTHALMIC ENDOSCOPE

DR. HARVEY E. THORPE demonstrated the ophthalmic endoscope and described its use in removing nonmagnetic foreign bodies from the eye.

GROSS SPECIMENS OF INJURED EYES

DR. EDWARD BURCHELL presented a series of gross specimens of injured eyes.

PANEL DISCUSSION ON OCULAR INJURIES

Question. What is your feeling about the A.M.A. evaluation of percentage loss of visual acuity in eye injuries?

DR. DAVIDSON. Six states use the A.M.A. system of evaluation without qualification. The principle upon which it is based, that is, geometric progression in the relationship between the visual-acuity loss and compensation, is sound. A more consistent application of a geometrically progressive principle is in line with a world-wide tendency and consensus of opinion. However, it should be applicable only when based on a 25-percent relation of compensation for the loss of an eye to that for permanent total disability, and it should give due recognition for damages with better than 20/25 visual acuity. With these modifications, the A.M.A. recommendations are essentially sound.

Question. Discuss the immediate versus the late plastic repair in case of burns.

DR. HUGHES. In fire or steam burns of less than third degree, where there is damage of the surrounding deeper tissues, it is often impossible to tell whether the tissue will survive. Since some of the tissue will heal with a result as good as can be obtained through early grafting, palliative treatment is indicated unless the eye itself is threatened. Lid adhesions may be required to preserve corneal viability.

In burns from strong alkalis or acids it is difficult to make sure that all the tissue infiltrated by the chemical is removed. In a severe fresh burn of the conjunctiva

with expectation of extensive loss of tissue, mucous membrane may possibly be used at once, before swelling occurs. All injured tissue must be dissected from the bed where the graft is to be placed; one may err by removing too much or too little of the partially destroyed tissue. While the theory of immediate grafting is enticing, practical, conservative early treatment will yield the best functional and cosmetic results in most cases.

Question. What method do you employ in the plastic repair of an avulsion of the lower lid medial to the punctum lacrimalis?

DR. SPAETH. The repair embodies three essentials: (1) the reattachment of the ruptured orbicularis fibers to a firm position; (2) the closure of the conjunctiva and skin and (3) rejoining the bore of the lacrimal canaliculus to the internal common punctum. The punctum is dilated, and a No. 2 Bowman probe is threaded through the canaliculus so that about 2 mm. of the probe appears in the end of the laceration. The cut lid angle is brought up to its normal attachment, and the probe passed through the common punctum into the lacrimal sac and thence down through the lacrimal-nasal duct. The probe is then bent at a right angle at the punctum, and cut off there after a second bend has been made within the lacrimal sac. This bend is just sufficient to hold the inner cut end of the lid margin in close approximation without tension upon the canaliculus. Tension results in a slough of the canaliculus. Two sutures are then placed, one on the posterior surface and the other on the anterior surface of the lid close to the lid margin, mattressed from side to side, across the line of laceration and tied. Other sutures are placed as necessary for closure subsequent to the catgut closure of the orbicularis fibers, and in connection with any debridement that is necessary. The orbicularis fibers must be closed carefully to prevent a lid sag.

Question. What method do you employ for the removal of nonmagnetic intraocular foreign bodies, especially glass?

DR. THORPE. I do not believe I ever removed a glass foreign body that was totally intraocular. The method of removing a foreign body depends upon its location. If it is in the cornea, splinter forceps may be used; and if it is within the layers of the cornea, one can cut down to it and pry it loose. For a foreign body in the anterior chamber, make a keratome incision and attempt to remove it with clot forceps. When the foreign body is in the angle of the anterior chamber the situation is less simple; the foreign body may not be visible, and the diagnosis is made by Vogt's skeleton-free X-ray method or by means of the gonioscopic contact lens. The foreign body is dislodged from the angle by means of forceps or may have to be dislodged with a hook. If it is caught in the iris it may be disentangled from it, although this usually cannot be done, and an iridectomy must be performed in that segment of the iris containing the foreign body. A foreign body of this type in the lens of a person over 45 years calls for an intracapsular extraction; this is not possible in younger people, on whom a loop extraction is performed. A foreign body in the ciliary body requires accurate localization, for this X ray with a Comberg lens is best, and it locates the proper meridian to dissect; the foreign body may then be extruded into the incision or can be felt and then removed. A nonmagnetic foreign body in the vitreous is removed preferably through an incision in the pars plana by means of a fine forceps under ophthal-

moscopic visualization; if the lens is cloudy and ophthalmoscopic visualization impossible, the incision should be made after the most accurate localization possible. One should try to see the foreign body by intense transillumination through the pupil and remove with forceps. If neither of these methods for removing the intravitreal foreign body is feasible the ophthalmic endoscope should be employed.

Question. How do you compute schedule percentage of disability following trauma in a claimant who developed a partial stationary lens opacity, reducing vision to 20/70 and who has faulty depth perception?

Dr. Davidson. Experience shows that faulty binocular depth perception cannot be caused by reduction of visual acuity of one eye to 20/70, regardless of the cause. If found to be present, the cause of the faulty depth perception must be sought for in a disturbance of the binocular motor apparatus, either the result of injury or preëxisting, and dealt with accordingly.

Question. In injuries of the cornea, what are the indications (A) for direct corneal suturing, and (B) for the use of conjunctival flaps?

Dr. Hughes. (A) No sutures are required in the case of tiny corneal injuries. Direct corneal sutures are required in: (1) nonpenetrating oblique wounds into the stroma when the superficial edge is likely to be displaced; (2) penetrating lacerations 2 to 5 mm. long that do not gape too much—mattress sutures give better support than single sutures; and (3) extensive lacerations with complete or nearly complete detachment of a section of the cornea.

(B) Conjunctival flaps are indicated in most extensive corneal lacerations. Corneal sutures retain firm holding power not longer than three or four days and the conjunctival flap provides additional support.

Question. How can one avoid notching of the lid margin in suturing the lid after injury?

Dr. Spaeth. As much skin, orbicularis, and tarsus as can be saved must be saved. Cicatrices in the superior cul-de-sac are usually the result of faulty closure there, and those connected with the tarsus are even more responsible for lid-margin notching than is faulty skin closure. A laceration in the lid which involves the levator to any great extent must be closed meticulously in the superior cul-de-sac, because the unopposed contraction of the lateral horns of the levator may separate the edges of the vertical laceration and permit the introduction of interposed tissue, with a resultant fullness of the upper lid and ptosis which could otherwise have been prevented. The conjunctival cul-de-sac and the tarsal plate up to the lid margin are closed through an external approach with 5-0 catgut, the edges being approximated accurately and according to the pattern of the laceration. The orbicularis fibers are then picked up and closed with catgut in a separate suture line offset somewhat from the line in the tarsal plate. The closure of the skin and lid margin is now the final step. At the edge of the laceration on the lid margin of the tarsus, two very tiny tongues are cut, each about 1½ mm. in length, and including all the tissue of the lid margin beyond the line of lashes. The lashes are closely trimmed at that point. Crescentic excisions are made in the skin surface and the first suture is placed at the lid margin through the tarsus only in such a way that the two tiny tongues of tissue

formed there are made to pout. This suture is of 5-0 catgut. Immediately above that, one introduces the first black silk skin suture, and the rest of the skin is closed with interrupted black silk sutures. After full healing, if there is any protuberance there, it can be readily wiped off with the actual cautery.

In general one should try to break up the line of vertical scars that are already present. Resection and subsequent closure for fresh injuries are frequently not sufficient. It is, therefore, wise to interpose a Z plastic of skin and long orbicularis fibers for the correction of a notching already present. All this is fruitless, however, unless tarsal deformities are simultaneously corrected. The V-Y plastic is frequently of use for the correction of lid-margin notches following minor injuries especially in the lower lid.

Question. Outline your routine for the removal of intraocular magnetic foreign bodies and indicate (A) choice of anterior and posterior routes (B) what precautions do you take to prevent retinal detachment?

Dr. Thorpe. (A) The corneal wound is outlined by means of fluorescein and the anterior chamber is restored with normal saline. If the foreign body is in the anterior chamber, the hand magnet is used to draw it into the incision. It may be necessary to depress the lips of the wound, but the magnet is not inserted into the anterior chamber, for this may cause cataract. If the foreign body is in the iris, an incision is made in the same region and an attempt is made to disentangle it with the magnet; if this is not possible an iridectomy is performed. An intralenticular foreign body may be permitted to remain until the lens becomes cloudy. It is difficult to remove very small foreign bodies from the lens. Sometimes the giant magnet will drag the foreign body back through the route of entrance and leave only a small wound. The usual method followed is to open the capsule and use a giant magnet to bring the foreign body into the anterior chamber. In the case of a very small foreign body, while there is a possibility of its being lost in the attempt at removal, an intracapsular lens extraction is performed. For a foreign body in the ciliary body, the pupil is dilated maximally, and the magnet applied obliquely to pull the foreign body through the pupil. If it hits the iris, which can be seen to bulge, the pull is made still more oblique to avoid entanglement. If the foreign body is located in the pars plana, the sclera is incised over it, two mattress sutures are inserted; the assistant pulls on the latter and the magnet is applied. For a foreign body in the vitreous near the wall of the globe, a radial incision should be made in the pars plana and the magnet applied. Instead of these incisions trephination, according to the method of Fralick, may be performed. It is best to pull foreign bodies in the posterior part of the vitreous or near the retina forward into the anterior chamber and treat them as anterior-chamber foreign bodies. A foreign body wedged in the sclera is removed by an incision between two mattress sutures which are pulled up; the choroid is incised and the hand magnet inserted just to that point; if it does not come out, the tip of a Lancaster magnet may have to be inserted into the vitreous. Although I have had little experience with the Berman locator, it has helped me determine whether the foreign body was magnetic and where it was closest to the sclera.

(B) A foreign body lodged in the retina is removed through a scleral incision; pulling it forward with the magnet may drag the retina forward with it. When a foreign body is to be removed through a scleral incision, first coagulate

the surface in the region of the planned incision.

Question. Should iridodialysis be treated surgically or not?

DR. HUGHES. In general, unless some definite cosmetic or functional advantage is to be obtained by operation, surgery is contraindicated. The feasibility of obtaining improvement in appearance or function must be considered in relation to the degree of disfigurement, the extent of the iridodialysis, the functional and visual disturbance, and the condition of the rest of the eye.

Question. How is loss of field compensated in the presence of normal central visual acuity?

DR. DAVIDSON. Compensation for loss of field in the presence of normal central vision, an extremely rare occurrence in civilian or industrial accidents—about 1 in 10,000 cases—is calculated on the basis of loss of one half of the field as the equivalent of 50 percent of the loss of an eye, and the central zone of 30 degrees as twice as valuable as the peripheral field. Sectors are dealt with accordingly.

Question. How would you handle a cut lid if ptosis intervenes?

DR. SPAETH. (A) Immediate treatment: Dissect sufficiently farther to permit uncovering of the cut edges of the levator and to reattach the latter by mattress sutures to the tarsus and superior cul-de-sac. It is entirely proper to extend skin lacerations so as to obtain sufficient exposure to accomplish this. Vertical lacerations lying close to the canthal angles, internal or external, will cause almost as much ptosis at that angle as may be seen in cases of horizontal stab wounds and lacerations. In addition, if such injuries are not properly closed primarily, the ptosis that results is a greater cosmetic blemish than that resulting from a horizontal laceration wherein the resulting cicatrix has, to a certain extent, reattached the levator to the lid.

(B) Late treatment: The approach can be from the conjunctival or the skin surface, in that it is possible to resect cicatrices either from before backwards or the reverse. The levator fibers are isolated, secured with sutures, the cicatrices removed, the levator closed after reattachment vertically or horizontally, and the case handled as an ordinary ptosis procedure, except that a partial tarsus resection is usually necessary in addition.

Question. In what conditions is the hand magnet the instrument of choice in foreign-body removal?

DR. THORPE. The hand magnet is the instrument of choice for foreign bodies located in the anterior chamber, in the iris, in the pars plana of the ciliary body, and for those foreign bodies in the vitreous which are near the lateral walls of the globe, or for those that are larger than 2 by 3 mm. in size and have to be removed by incision either in the pars plana or in the scleral wall posterior to the ciliary body. The giant magnet is often used for small foreign bodies in the cornea, in the lens and for those located far back in the eye, and wherever increased strength is desired.

Question. Can the following lesions result from trauma to the head: (A) Keratitis; (B) Rupture of the iris or iris sphincter; (C) Cataract; (D) Detachment of the retina; (E) Rupture of the choroid; (F) Retinal hemorrhage?

DR. DAVIDSON. (A) Keratitis can be caused by a head injury which injures the fifth nerve or its branches and is usually accompanied by other intracranial-nerve injuries.

(B) and (C) I have never observed

these as a result of head injuries and doubt their possibility.

(D) Detachments of the retina can take place in eyes predisposed by degenerative lesions and previous intraocular injuries, such as contusions, intraocular foreign bodies, following head injuries in the same way that the last straw can break the camel's back. The head injury must be bona fide and a retinal tear observed within a very few days, and the detachment noted within two weeks, for other insults may cause it, too, in such predisposed eyes.

(E) I have never seen this and doubt its occurrence as a result of head trauma.

(F) Retinal hemorrhages rarely may be observed in head injuries that are followed by intracranial hemorrhages, particularly in the presence of fragile pathologic vessels or hypertension.

Question. How would you handle penetrating wounds with (A) Prolapse of tissue—iris, ciliary body; (B) Prolapse of vitreous; (C) Dislocation of the lens in the anterior chamber; (D) Foreign body of the cornea projecting into the anterior chamber?

Dr. Hughes. (A) One may replace a simple small prolapse of undamaged iris associated with a clean recent wound after cleansing and applying germicidal drops. Atropine or eserine keeps the iris away from the wound, depending on its location. Air is introduced and the head tilted so a bubble separates the wound from the underlying tissues, preventing synechiae. Sulfa drugs and possibly foreign protein are administered.

The exposed portion of a badly torn or macerated iris is excised and the remainder replaced. If the edges of the laceration are tightly approximated, air may be inserted. Corneal sutures or a subconjunctival flap may be necessary.

Extensive prolapse of the ciliary body calls for enucleation. Small wounds in the ciliary region are watched carefully for sympathetic ophthalmia, regarding which the patient should be informed.

(B) Prolapse of the vitreous should be excised with scissors, the excess sponged away, and the wound closed with sutures.

(C) If the iris is intact, use eserine and keep the eye dependent to avoid losing the lens in the vitreous. When to remove the lens would depend on the nature, location, and extent of the original laceration and on numerous other factors in the condition of the eye itself, likelihood or presence of frank infection, and so forth.

At the operation itself, ultraviolet light to render the lens clearly visible is a real aid, especially if there is a possibility that the lens may drop posteriorly. The operation is best done with the head held on one side and the incision made to include the lowest portion of the limbus, so that the lens will have a tendency to come toward the wound by gravity.

(D) If magnetic, the foreign body should be removed with the magnet. If nonmagnetic one can often work under a corner of the object, often under guidance with the slitlamp, with a small, sharp-pointed instrument, and gradually tease it forward. If the foreign body cannot be removed through its wound of entrance, the wound may be enlarged or an oblique incision made for the removal. It may be necessary to protect the lens from the forein body by using miotics or teasing the foreign body loose from the cornea with the point of an Agnew keratome before the chamber is lost. A blunt Tyrel hook is frequently useful in maneuvering a nonmagnetic foreign body from inside the anterior chamber. Every effort must be made to prevent losing it posteriorly through the pupil. The patient may need to be operated on with the head

sidewise to allow the object to gravitate toward a limbus opening.

Question. How would you handle a stab wound of the orbit with division of an extraocular muscle?

DR. SPAETH. Prevent paralytic ptosis, as already discussed. The immediate surgery of exploration and an attempt to rejoin the cut edges of an ocular muscle has, up to now, proved not too satisfactory. This has been anatomically accomplished on the external rectus, but the late paralysis has been just as marked as if it had been unsuccessful. This has probably been due to sectioning of the nerve. Traumatic laceration of the origin of the inferior oblique was sutured with good results in one instance and fair results in another. In two other cases surgical exploration showed the muscles to be cut so far back in the orbit that the attempts to rejoin the cut edges of the muscles were unsuccessful. It seems best to permit primary healing and thereafter correct the paralytic strabismus that results by means already known to us. Naturally, in these cases, one presumes that the globe has not been injured.

Question. (A) What has been your experience in cases presenting siderosis and what is the ultimate outcome after removal of the foreign body? (B) Can siderosis develop if the steel is extraocular, as in the orbit?

DR. THORPE. (A) Siderosis may commence one to 24 months after a foreign body is present. Siderosis depends on the chemical composition of the intraocular foreign body; some steel alloys do not produce siderosis. The onset is very slow in the case of an intralenticular foreign body.

In reference to ultimate outcome, I have not seen it clear up under the lens capsule after removal of the foreign body. I have seen it clear up in the iris.

(B) I have never seen siderosis develop in an eye if the foreign body was extraocular.

Question. What are the distinguishing characteristics of an ocular contusion in retrospect?

DR. DAVIDSON. In the last war, Henri Frankel recognized the fact that the lesions of eye contusions are not haphazard phenomena indiscriminately affecting isolated structures of the eye, but constitute a definite syndrome. Its several signs result from the action of the lens which is temporarily subluxated because of the momentary distortion of the eyeball. There are, accordingly, lens lesions and iris pigment on the lens capsule, traumatic iridoplegia, and peripheral-fundus lesions. To these may be added two signs demonstrable only by biomicroscopy; namely, dehiscences of the pigment layer of the iris, manifested by diapupillary transillumination, and the presence of retinal pigment epithelium dispersed and enmeshed in the anterior vitreous. A preferable name for the syndrome would be anterior-segment contusion syndrome, and at least two of its signs are to be found in every case of ocular contusion as permanent sequelae. Contrecoup lesions of the posterior segment are observed in about one third of the cases in association with anterior-segment lesions and are conditioned by the vulnerability of the macula and perhaps by the anchorage of the optic nerve and the insertion of the inferior oblique muscle.

Question. How do you treat injuries of the ciliary body with respect to enucleation?

DR. HUGHES. Treatment of severe lacerations associated with protruding ciliary-body tissue has been discussed. After small penetrating injuries through

the ciliary body, irritation for more than two weeks or mutton-fat deposits on the posterior corneal surface call for enucleation. Recession of the near point of accommodation in the opposite eye in a short period of time, with increase of cells or relucence of the beam, in the aqueous or retrolental space, makes enucleation imperative. In the first two weeks there is no urgency. After the first several months, the longer the interval after the injury the less the danger to the fellow eye. Nonsensitivity to uveal pigment, as determined by intracutaneous test, lessens the likelihood of development of sympathetic uveitis. This test requires 14 days and is of little value for an immediate decision. In general, in an injury to the ciliary body, lean toward enucleation.

Question. Discuss sympathetic ophthalmia in relation to: (A) Youth of the patient; (B) Size of the wound; (C) Prolapse of uveal tissue; (D) Nontraumatic cases.

DR. SPAETH. (A) Sympathetic ophthalmia seems to occur most commonly in younger individuals. It is certainly a common finding before the tenth year of life. It is a relatively much less common finding after the fourth decade, if the frequency incidence of injury and surgical procedures are taken into consideration, according to these same age groups. Computed on this basis, it shows sympathetic ophthalmia most common in the middle 20 years of life, next in the first 20 years, and least frequent in the remaining years of the average span of life. Under such circumstances it does seem as if advancing years give protection, to a certain extent, from sympathetic ophthalmia.

(B) The size of the wound is roughly related to its development, although several cases are on record of needle penetration with subsequent sympathetic ophthalmia. On the other hand, the massive lacerations of explosive force is one of the most common causes for the development of the condition.

(C) Prolapse of the uveal tissue is not an essential for the development of sympathetic ophthalmia. Cases as seen following cataract surgery, following cyclodialysis, after an iridectomy for traumatic prolapse of the iris, seem to suggest that the mechanical factor necessary is injury to the uvea rather than prolapse of the uvea. Prolapse of the uveal tissue, however, will result in more injury to the uveal tissue with continued irritation. One can almost think of it as a summation of tissue insults, permitting us to say that prolapse of the uveal tissue probably results in a higher incidence of sympathetic ophthalmia than is the case when prolapse has not occurred.

(D) There has been some controversy in the literature relative to the development of sympathetic ophthalmia in nontraumatic cases. It is my opinion that trauma with perforation is a *sine qua non* for the development of sympathetic ophthalmia. This must include surgical trauma as well. I prefer considering the development of irritation in the fellow eye in the presence of a nontraumatic iridocyclitis of the first eye, an iridocyclitis probably from the same basic pathology and not one of sympathetic ophthalmia. Duke-Elder speaks very definitely of the necessity for injury and differentiates this from the sympathetic reflex irritation present in the fellow eye in association with disease in the original eye. An iridocyclitis that has progressed to phthisis bulbi has been said to give rise to sympathetic ophthalmia, but in such instances one again must be certain, in the absence of surgery to the iridocyclitis or the absence of perforation of the cornea, that the condition is not a parallel or coincident infection.

While the etiology of sympathetic ophthalmia is unknown it is almost certain that it is infective in origin, probably exogenous primarily, eventually becoming systemic, but exciting no symptoms, and is localized in the sympathizing eye because the uvea forms the only favorable nidus for its development. Allergic sensitization and development has also shown considerable experimental confirmation. Woods's conclusions are rather pertinent. They are to the effect that normal healing of a wound is associated with the appearance in the blood stream of antibodies specific to and for uveal pigment; that when protracted inflammation occurs, these antibodies do not appear; and further, when sympathetic ophthalmia appears, not only are these antibodies found to be lacking, but a cellular hypersensitivity for uveal pigment develops.

Question. Describe the technique for the removal of nonmagnetic intracorneal foreign bodies.

Dr. Thorpe. For foreign body on the surface of the cornea with an iron-rust ring: With a Graefe knife, or a knife needle, make a small incision just at the edge and pry the ring loose. If any small pieces break off and remain, curette the surface thoroughly. Some doctors prefer using a dental burr.

A foreign body located between the layers of the cornea, such as a piece of brass, is extremely difficult to remove. It is necessary to cut down on this foreign body, usually near one side of it. Get beneath it and try to draw it forward. A very useful instrument for removal of intracorneal foreign bodies is a fine watchmaker's forceps which has had fishhook teeth put in with a fine saw. This will grasp the foreign body, and wood splinters will not slip off. The foreign body that penetrates into the anterior chamber has been adequately discussed.

Leon H. Ehrlich,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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SHALL WE NATIONALIZE MEDICINE?

Under this title Lord Horder, G.C.V.O., M.D., F.R.C.P., in an address delivered before the Cardiff (South Wales) Medical Society (British Medical Journal, March 17, 1945), raises a number of interesting questions as to the present movement in the direction of state medicine. "By nationalizing medicine," he says, "I mean doing with medicine what the Socialist desires to do with the land, the banks, the coal mines, and the railways—bring them under the control of the State." "This," he continues, "is equivalent to a whole-time State service for all doctors, and that is what I mean by 'nationalized medicine.'"

The speaker objects to the term "state medicine" as not free from ambiguity and to "socialized medicine" because "it may mean making medicine more accessible to the people; and . . . this may be done without nationalizing the medical profession."

We are reminded that "the fundamental note in the doctor's ideal is freedom. But what happens to our freedom," continues Horder, "if we are a part of a nationalized service? . . . I am speaking of our freedom as members of a profession. We must preserve 'free speech on medical matters, free criticism of medical affairs, and free publication of scientific work.' If medicine is nationalized it is to a large degree monopolized, it is stereotyped."

The sponsors of the British Government's "White Paper" on socialization of medicine have denied that the document envisages the beginning of a whole-time medical service. On the other hand, Horder points out that the British Labor Party has issued a brochure in which it is declared necessary "that the medical profession should be organized as a national full-time salaried, pensionable service." Sir William Beveridge, probably the chief author of the White Paper, seems to have little doubt on the subject, and said in a special report: "The possible scope of private general practice will be so restricted that it may not appear worth while to preserve it."

There are apparently a few extreme advocates of state medicine who think it advisable to make every physician a full-time servant of the State. Yet this attitude is far from general. In this, as in other aspects of the whole problem of socialized medicine, not only is opinion fluid, but no person now living can know with certainty what the ultimate framework of medical practice will be.

Horder, like many other physicians, fears that if medicine were nationalized "the spirit of individual initiative and adventure which has always characterized British medicine would be seriously damped, and men and women with good brains and healthy ambition would no longer be attracted to the profession." It is worthy of note, however, that, in spite of Horder's apparent acceptance of the belief that full nationalization is the ideal of the sponsors of socialization in Great Britain, he suggests that if medicine were nationalized the "black market" in doctoring would be terrific.

An interesting feature of Horder's address is the extent to which, while condemning "nationalization," he approves of medical services which only through socialization can become generally available to persons of moderate means. In other words he shares the general trend toward socialization of medicine which has been manifested for many years, and which is likely to show a steady further advance regardless of the fate of legislative measures now under consideration in Great Britain and the United States.

Horder is probably correct in his impression that a proposal to make full-time civil servants out of doctors would in itself be capable of producing a widespread reaction against a scheme for national medicine. "I believe," he says, "that the public, when it is really stirred to consider the matter, when it really thinks, . . . will decide against making all doctors Civil Servants." For this, he intimates, would in considerable degree destroy the doctor-patient relation.

In the general proposals thus far advanced in the two great English-speaking countries, it is rather difficult to find definite suggestions that all doctors should be made civil servants, in other words, full-time employees of the state; and according to these proposals it seems rather probable that very many general physicians, even many consultants, might still retain the doctor-patient relation. It should be realized, moreover, that at the present time the doctor-patient relation is hardly possible or essential in the Public Health Service, where excellent work is done by doctors who are civil servants. Nor, at the present time, is the doctor-patient relation very much to the fore in some specialties, such as pathology and bacteriology, or radiology. Obstetric work as carried on in a great municipal hospital is also less conspicuous for this relationship than some other medical activities.

Perhaps Horder's title ought to have been modified to read "To what extent shall we nationalize medicine?" although this might have been less rhetorically attractive as the title of an address or of a leading article. The establishment of

the National Health Administration of Great Britain was a long step in the direction of nationalization. Each World War, particularly as regards the United States, has moved in the direction of nationalization, by bringing greater numbers of veterans and their families under the medical control of Federal agencies. If for simplicity we loosely include the activities of local governments under the meaning of nationalization, very much in the practice of medicine among the poorer social groups has been nationalized for a long time.

But it is a far call from any of these activities to the bogie which Horder erects and then demolishes, of a state system of medicine in which every physician would be a civil servant and no citizen could obtain private medical care. Professor John A. Ryle, of Oxford, criticising Horder's address in a subsequent issue of the British Medical Journal (1945, March 31, page 456), stigmatizes as an "assumption" Horder's argument that "State medicine must necessarily impose control on the professional thought and actions of the doctor and spoil his age-long human relationships with his patients." Ryle suggests that there is no reason why free speech on medical matters, free criticism of medical affairs, and free publication of scientific work should not be preserved under a national system.

Horder's address gives to some extent the impression of an attempt to please his medical audience without too vigorously committing himself to either extreme of the argument. Perhaps this attitude was necessary in a district where the Socialist viewpoint is particularly strong among the general population, and where it may be supposed that this political coloring has affected a rather greater proportion of physicians than in other parts of Great Britain.

We can, however, all sympathize with Horder's admiration of the ideal doctor-patient relation as described in Nathaniel Hawthorne's "Scarlet Letter," and with Horder's answer to the self-imposed question "Do you see hope in the future of medicine?": "Yes," he says, "I see more hope, both for ourselves as doctors and for the people who will come under our care, in the future of medicine than perhaps in any other single thing in the new world towards which we are hacking our way. . . . We stand for sane knowledge, selflessness, and mercy in a world gone mad. We cannot let down these people who trust our profession, and it is in this firm resolve that we shall face the future of medicine."

W. H. Crisp.

PREPAYMENT OF MEDICAL CARE

Occasionally in previous editorials and elsewhere the writer has introduced the subject of prepayment of medical care in connection with other items of economic importance to the doctor, but has had in mind to discuss this more fully when opportunity arose. The introduction into Congress of a revived Wagner-Murray-Dingell Bill, 1945 model, provides this excuse.

Prepayment of medical care is no new idea. In June, 1944, a second edition of its publication "Prepayment medical care organizations" was distributed by the Social Security Board. It lists 219 such associations. Even a casual glance through this 130-page booklet suggests that many of these have been in existence for a long time, some of the private groups having been formed more than 25 years ago, and state organizations earlier. In the plans listed, and a fair number have been omitted, over three million persons are eligible for care.

In the writer's file on this subject is an editorial from the St. Louis Post-Dispatch of October 29, 1944, on "City sponsored health insurance plan with full medical coverage about to be launched in New York."

The plan was backed by Mayor La Guardia and a group of "outstanding" citizens and was to be available to families with annual incomes of $5,000 or less. The first participants in the plan were to be city employees, but opportunities for enrollment were to be offered to groups of 50 or more in private industry. This plan met the opposition of local, state, and national medical societies, which offered a counterplan for broadening the highly effective Associated Hospital Service. The outcome of these proposals is not known to the writer and their details need not be considered here, since probably no action has been taken on most of the larger proposed plans because the legislation pending in Congress would place the whole matter on a nation-wide and Federal basis. It is cited merely as evincing a straw in the wind.

Some state medical organizations, as in Missouri, have approved and are beginning to carry into effect plans that must be regarded as an attempt at placating the people who want prepaid care. In that State organized medicine has presented a scheme for voluntary enrollment of members and doctors to care for patients while in hospital for certain conditions at specified rates which, however, can be raised by agreement between patient and doctor. Enrollment costs for the patient are very reasonable but the proposition seems scarcely attractive enough to be very far-reaching.

The revised version of the Wagner-Murray-Dingell Bill is discussed editorially in the June 2d issue of the Journal of the American Medical Association, in which issue there is also the first part of a discussion of the Bill in detail. As the editor points out, the compulsory feature is everywhere pushed into the background, and choice of participating physicians as to fee-for-service or salary payment is stressed, but nevertheless compulsion is there.

Pertinent to this discussion is a report of the Health Program Conference, a by-product of the Committee on Research in Medical Economics, entitled "Principles of a nation-wide health program." This group was composed of 26 well-known individuals, lay and medical. The second paragraph of the summarized report contains the gist of the matter:

"Medical services should be financially accessible to all through a national system of contributory health insurance, combined with taxation in behalf of people without sufficient income, preventive services and needed extensions and improvements of facilities. In order that comprehensive service shall be available to all or most of the population and in order to minimize the administrative costs of acquiring members, it is essential that financial participation in the system be required by law. The contribution for medical care insurance will not mean an added burden on the earnings of workers. The American people are now spending for physicians' services and hospitalization enough to provide for all with only minor supplementation, if these payments are regularized, instead of falling with disastrous uncertainty. Place should be maintained for voluntary action by many agencies as well as for action by our national, state and local governments." The second sentence, insisting on the necessity of the service's being compulsory certainly dismisses a very dubious point in a summary manner. This involves the acceptance of a completely paternalistic attitude with regard to the medical care of the American people. We don't have compul-

sory Federal education, but we are to have compulsory medical care. These two things are different, to be sure, and medical care is distinctive from every other type of care, and perhaps being so closely bound to the welfare of the nation and being humanitarian as well it is wise to make it compulsory nationally, but at least let us recognize that this is the action that is being taken and not accept it unknowingly.

Three methods of payment of the physician are suggested and the last promptly discarded as having been tried and found wanting. This is the fee-for-service principle. The first method is the obvious one of annual salary, presumably somewhat on a time basis; the second, or capitation, method is that under which the physician is paid a fixed amount per annum for each person who selects him as his regular doctor. Obviously that might serve for that specimen now rarely found except in rural communities, the general practitioner, but would be impractical for specialists. Hence only the annual salary remains.

An interesting article along these lines appeared in the December, 1944, issue of Fortune, entitled "U.S. medicine in transition." The race between the doctor's efforts to formulate some acceptable voluntary plan and the public's demand for a Federal plan is discussed with the conclusion that the Federal plan will probably win.

This writer feels certain that some prepayment plan or plans will surely be worked out soon for almost everyone. The method is expedient and economically sound, but it is still questionable in his mind whether it should be compulsory; there might well be loopholes for doctors and patients who preferred some other method of handling medical care. Probably the salary plan for all physicians would lower the general character of medicine but perhaps broadening the base of service would compensate somewhat for this.

Lawrence T. Post.

OBITUARY

MARK J. SCHOENBERG*
(1874-1945)

Mark Joseph Schoenberg was born on December 23, 1874, in the little Rumanian town of Pitesti. Upon completing the course in the local school and "gymnasium," he was admitted to the University of Bucharest, where he was graduated M.D. in 1898. After two years of graduate work in Vienna and in Germany, he came to America in 1900, and began the practice of medicine on the lower East Side of New York. While at first the necessity of earning a livelihood compelled him to practice general medicine, his interests and his graduate training naturally guided him into the specialty of ophthalmology.

After working in the Eye Clinic of the Mount Sinai Hospital and for a few years maintaining his own clinic and hospital in lower Manhattan, he became associated with the New York Ophthalmic and Aural Institute under Hermann Knapp, in 1908. After the death of its founder, this institution became known as the Hermann Knapp Memorial Eye Hospital, and in 1918 Dr. Schoenberg was made attending surgeon. While there, he taught in the Graduate School maintained by the Hospital, as well as at the College of Physicians and Surgeons of Columbia University. Somewhat later, he became Consultant in Ophthalmology to the Presbyterian Hospital and to the Bronx Hospital.

For some years he had been intrigued by the problem of glaucoma and had ad-

* Read at the New York Society for Clinical Ophthalmology, March 5, 1945.

vocated, among other things, the creation of clinics devoted especially to the study of that disease. The first Glaucoma Clinic was established at the Knapp Memorial Eye Hospital in 1935, and Dr. Schoenberg was made its director.

The pursuit of the problem of glaucoma became a passion with him, and he was instrumental, with the coöperation of the National Society for the Prevention of Blindness, in the establishment of glaucoma clinics in other hospitals. Up to the time of his death he was director of the Glaucoma Clinic of the Manhattan Eye, Ear, and Throat Hospital as well as consulting ophthalmologist to that institution. He was also chairman of the Committee on Glaucoma of the National Society for the Prevention of Blindness, as well as a member of the Board of Editors of its publication, the Sight-Saving Review. To him is due much of the credit for focusing upon glaucoma the attention of medical practitioners and the lay public. A considerable portion of his recent research has been on the early detection of glaucoma and even of the preglaucomatous state by means of studies of ocular drainage and pupillography. His elucidation of the psychosomatic factor in glaucoma is an example of the breadth with which he viewed the problem, and may yet prove to be of fundamental importance.

Dr. Schoenberg contributed much to ophthalmologic literature as well as to open discussions at scientific meetings which he attended faithfully and with enthusiasm. He was a Fellow of the American Academy of Ophthalmology and Otolaryngology, the American College of Surgeons, and the New York Academy of Medicine, of whose eye section he served as chairman in 1932. He was a member of the American Ophthalmological Society, the New York County and State Medical Societies, and the American Medical Association. He was one of the founders of the New York Society for Clinical Ophthalmology and served as the president of that organization in 1935.

In 1940, on the occasion of his sixty-fifth birthday, a number of his colleagues gave him a testimonial dinner at which he was presented with a large bound volume containing all his scientific articles, 46 in number. For his work on the experimental study of anaphylaxis the New York State Medical Society awarded him the Lucien Howe Medal.

These were his material achievements, such as one might expect of any outstanding physician and scientist of Dr. Schoenberg's stature. What endeared him to those about him, whether family, colleagues, pupils, or patients, was the warmth and charm of a nature which made only friends. Those of us who had the good fortune to be closest to him were familiar with the special kind of radiance that would come into his face and voice when speaking of his family.

To us, his colleagues, his assistants, and his pupils he was known as the one with the youngest mind, a mind which never grew tired of seeking and probing, an intellect which glistened from the numerous facets of his varied interests. The enthusiasm with which he pursued an intellectual problem was contagious to those about him; his cheerfulness and sharp wit and good-natured humor made working with him a pleasure. At least one of his pupils has named a first-born son after him.

To his patients, whether those in high places or the poorest or most ignorant, he gave not only of his skill, but of his heart. While he might occasionally lose patience with a patient in the office, he has never been known to be anything but gentle in the clinic, where he exhibited his great talent for putting people at ease without being patronizing. Best of all evidence of his nature was the spontaneity with which young children trusted him.

While not a religious man in the con-

ventional sense and scarcely ever attending formal services at synagogue, his life was a fine example of the ethics, morality, and culture of his race at their best. He lived for his fellow man and for his chosen work, and he gave freely of his time and earnings to those less fortunate than himself. The high station which he had attained in his community did not prevent him from remaining decidedly liberal in his political thinking and his philosophy. He left behind him no great fortune, but rather innumerable lives made better by the gift of sight at his hands, very many others enriched by the privilege of his friendship.

His only fault was his inability to conserve his energy, and this, at least in part, was his undoing. Although many times warned that he must reduce the burden of his work, it was not in his nature to do less than the maximum. He continued, not only in the office but in the clinic until only a few months before his death.

It is with heavy heart that we realize that Dr. Schoenberg will no longer be among us. Admittedly there are many ophthalmologists who are skillful of finger and brilliant of mind, many who are upright, and generous and good, some with presence and culture and taste, a few with a delightful sense of humor. Rare to find are those who combine these qualities as did Mark Schoenberg.

Benjamin Esterman.

CORRESPONDENCE

THE CASE AGAINST THE BLANK OCCLUDER

Editor,
American Journal of Ophthalmology:

It is as natural to shorten focus (accommodate) when a large opaque object is brought close to the eye as it is to close the lids under the same circumstances. Therefore, if a strong plus sphere be substituted for the blank occluder in all tests of refraction, except in patients having marked amblyopia, it will be found that a much greater amount of latent hyperopia will be uncovered in a high percentage of cases. The eye will look *through* the plus lens. It will look *at* the blank occluder and a variable amount of accommodation will be the inevitable result.

After the manifest refraction is tested in each eye separately it is desirable to fog both eyes slightly and equally by the addition of plus spheres; then by exposing them alternately and adding more plus sphere to the eye having the better vision at distance, they are brought to a state where they see equally badly. This balances the spherical equivalents of the two eyes and when it is followed by a gradual, equal, and simultaneous reduction of plus spheres before them the point of the greatest vision with the greatest plus is most easily ascertained.

However, if in this balancing procedure a blank occluder has been used, the eye most recently behind it will be partially dark adapted, and the patient is apt to pick the brighter image rather than the one exhibiting the better definition.

It is my conclusion that the blank occluder is a pernicious adjuvant to the refraction of nonamblyopic eyes, and that its further results in many patients' being classed as myopic when their true uncorrected vision may be far in excess of the 20/20, at distance, customarily required in certain occupations.

(Signed) H. E. ALLEN
Metropolitan Building,
Columbia, Missouri

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

8

GLAUCOMA AND OCULAR TENSION

Kronfeld, P. C., and Haas, J. S. **Glaucoma due to peripheral anterior synechias after operation for cataract.** Arch. of Ophth., 1945, v. 33, March, pp. 199-202; also Trans. Amer. Ophth. Soc., 1944, v. 42.

The multiple factors which influence intraocular pressure are so closely interrelated and regulated in the normal human being that it is almost impossible to attribute a given rise in intraocular pressure to the action of any single factor. Even in the case of the best known rise occurring in the normal human eye, that during Valsalva's experiment, one is unable to decide whether the cause is increased volume of blood in the uvea or interference with the function of Schlemm's canal. Ocular disease occasionally singles out one of the main factors concerned with the regulation of intraocular pressure and thus creates a glaucomatous state with a much simpler mechanism than that underlying normal intraocular pressure. A classic example of such a glaucomatous state is that caused by peripheral anterior synechias following prolonged absence of the anterior chamber after operation for cataract. The detailed study of such eyes promised to yield information of value for the understanding not only of this type of glaucoma but also of problems of regulation of intraocular pressure in general. It was for these two reasons that the present study was undertaken.

The study concerns itself with states of persistently elevated intraocular pressure of aphakic eyes in which (1) careful examination before extraction of the cataract, including at least one tonometric reading, had revealed no sign of glaucoma; (2) the inflammatory postoperative reaction was slight and either had completely subsided or was definitely diminishing in intensity 14 days after operation; (3) the anterior chamber had been absent for at least six days after operation; (4) extensive peripheral synechias were found on gonioscopic examination; (5)

the severity of the glaucoma closely paralleled the extent of the peripheral anterior synechias; and (6) observation of the normal second eye after the surgical procedure revealed no sign of glaucoma.

Invariably in the cases thus complicated no sutures or only conjunctival sutures had been used during the operation for cataract. Thus it appears highly probable that absence of the chamber was caused by external fistulation.

The following phenomena were studied: (1) the diurnal variations of intraocular pressure; (2) the response to parasympatholytic mydriatics; (3) the response to the drinking test; (4) the response to puncture of the anterior chamber; (5) the response to corneal massage for two minutes with the tonometer of Schiötz, using the 15 gm. weight; (6) the response to pilocarpine.

After admission and acclimation to the hospital most patients showed diurnal variations of a regular pattern. The taking of measurements was restricted to intervals of four hours to reduce the possibility of thereby altering the intraocular pressure. The curve was invariably of the inverted type, with the low value at 2 a.m. and the high point between 10 a.m. and 2 p.m. In corroboration of previous findings of Raeder and Kronfeld, the morning rise could be prevented by keeping the patient asleep or could be precipitated earlier by mild exercise at 2 a.m.

Tonometric measurements made at or around noon are most likely to reveal the highest pressure reached by the individual patient. Of the provocative tests, introduction of a mydriatic and puncture of the anterior chamber are not likely to give definitely abnormal results. The massage test and especially the drinking test are more likely to reveal insufficiency of the apparatus regulating intraocular pressure.

With regard to conservative therapy, it would seem reasonable to use miotics during the early morning to prevent the usual morning ascent of intraocular pressure. The first application should be made "the very first thing in the morning," and this should be followed by one to three additional applications during the morning if necessary. During the afternoon and during the night these eyes more or less take care of themselves. An application before the patient retired would be wasted, since its effect would not last until the next morning. (3 charts, 3 tables, references.) R. W. Danielson.

Meyer, S. J., and Sternberg, P. **Surgical management of glaucoma in correlation with gonioscopy and biomicroscopy.** Trans. Amer. Acad. Ophth. and Otolaryng., 1945, 49th. mtg., Jan.-Feb., pp. 147-154.

Ordinarily the acuity of the angle may be obtained with the biomicroscope by placing the slitlamp beam perpendicular to the cornea at the site of the angle of the anterior chamber, the corneal microscope being angled for specular reflection and focused first on the posterior surface of the cornea and then on the anterior surface of the iris. Gonioscopically, narrow-angle glaucoma is usually acute primary congestive glaucoma. Although narrow, the angle is usually open when the first attack begins but closes more or less completely during the attack. Iridencleisis is preferred to basal iridectomy, which should be done during the first 24 hours of the acute glaucomatous attack. The trephine operation is here considered technically difficult and the risks are usually too great to justify its

performance. In simple or wide-angle glaucomas, the narrow-angle mechanism is excluded. Varying amounts of pigment deposit within the corneoscleral trabeculae, trabecular sclerosis, and peripheral synechias are present in the later stages. Here iridencleisis is also preferred unless marked iris atrophy exists. Then trephining is the operation of choice.

In secondary glaucomas following cataract extraction, the anterior chamber is gonioscopically closed and peripheral anterior synechias of varying extent are present. Cyclodialysis is usually not advised in narrow-angle glaucomas and only occasionally in wide-angle glaucomas with slightly elevated tension or as a secondary operation following a partially successful filtering operation. In glaucoma associated with capsular exfoliation the gonioscope shows deposition of fine flakes throughout the angle structure usually accompanied with heavy pigmentation of the trabeculum. The angle is of the wide-angle type with relative absence of peripheral anterior synechias. Iridencleisis or trephining may be performed, because of width of the angle. The former is preferred. Glaucoma surgery is advised first and cataract surgery later, if necessary. In hemorrhagic glaucoma following occlusion of the central retinal vein the angle is open gonioscopically during the earlier stages, but later is completely closed. In diabetic rubeosis iridis, the biomicroscopic and gonioscopic findings are similar. In both, the inferior half of the pars plicata of the ciliary body is diathermized. Enucleation is the alternative surgical procedure. In glaucoma associated with lenticular intumesence, the gonioscopic picture is much the same as in acute glaucoma. Removal of the lens by combined extraction is advised, avoiding sudden decompression and trauma to the iris or lens. Charles A. Bahn.

Rocha, H., and Bonfioli, A. **Gonioscopy and hydrophthalmos.** Ophtalmos, 1944, v. 3, no. 3, pp. 243-249.

After brief discussion, the author expresses the following opinions: In the majority of the cases, congenital glaucoma arises in obstruction of the chamber angle by persistent mesodermic tissue. Absence of the canal of Schlemm, and peripheral synechias, are effect and not cause. Gonioscopy ought to be a routine practice in these cases. Operation (goniotomy) before the age of one year is desirable. (One color plate with diagram.) W. H. Crisp.

Williamson-Noble, F. A. **Remarks on iridencleisis.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 324-331.

The author advises that a miotic be not used for at least 12 hours before the operation; that retrobulbar injection of 2 c.c. of 4-percent novocaine with the addition of 4 drops of adrenalin be used except in older patients with high blood pressure; that the conjunctival flap include the episcleral tissue; and that a keratome incision be so made in the limbal area that on withdrawal of the keratome the section be 5 to 6 mm. long. Massage of the eyeball is begun after the first dressing, having the patient look up and massage the ball lightly through the lower lid for half a minute and repeating twice daily, unless the eyeball is soft. The patient is advised to perform the massage two minutes twice daily for six months after leaving the hospital. (References.)

Beulah Cushman.

9

CRYSTALLINE LENS

Bannon, S. L., Higginbottom, R. M., McConnell, J. M., and Kaan, H. W. **Development of galactose cataract in the albino rat embryo.** Arch. of Ophth., 1945, v. 33, March, pp. 224-228.

In 1935 Mitchell first reported the type of cataract in rats which results from a diet containing a high level of galactose. A series of investigations, begun in 1937, have definitely established the fact that when pregnant female rats are fed a diet containing 25 percent of galactose, cataractous changes appear in the lenses of the embryos. The authors outline the results obtained in three strains of rats, making a study of more than 300 lenses from a normal series and an approximately equal number from the experimental series. Detailed technical description of the lens changes is given.

The location of the primary area of degeneration within the lens nucleus is a characteristic of cataract in the young. If cataract is the result of a metabolic disturbance, presumably those areas of the lens which have a higher metabolic rate should be the most susceptible. The sequence of cataractous changes in the embryo is clearly related to developmental changes within the lens. Onset of the cataract affects the central fibers, which are undergoing modifications preparatory to the formation of the lens nucleus. As development progresses, closure of the posterior suture marks another region of cellular activity, and cataractous changes shift from the central to the more posterior region of the lens. Sections of normal lenses show that vacuoles arise apparently as the accompaniment of normal activity. Extreme vacuolation seems to be due to continuation and exaggeration of a condition already existing within the lens. Comparison of the photomicrographs, all taken at the same magnification, makes it apparent that presence of the cataract does not interfere with normal increase in size of the lens. Thus, it is not the growing regions which are affected but those portions of the lens which are undergoing differentiation. (2 figures, references.)

R. W. Danielson.

Bellows, John. **Frequency and location of punctate opacities in three hundred young crystalline lenses.** Arch. of Ophth., 1945, v. 33, March, pp. 229-236.

The frequency of opacities in the young crystalline lens is so great that it has been considered physiologic by some ophthalmologists. The purpose of this investigation was to determine the incidence of opacities in Americans between 18 and 40 years of age and to correlate changes and age in the hope that light might be thrown on the causation of senile cataract. In a United States Army general hospital, slitlamp examinations were made while the eyes were under homatropine cycloplegia. Altogether 150 subjects, or a total of 300 eyes, were examined, eyes showing signs of ocular disease or of trauma being excluded.

Only 8 of the 300 eyes examined were entirely free from lens opacities. All others showed punctate opacities in one or more regions of the lens. Because of the difficulty of differentiating between congenital and presenile forms of punctate opacity, the latter were considered to be physiologic and were included in this survey. In 4 percent of the eyes the opacities were associated with coronary cataract. Punctate opacities were found in all the layers of the lens, but were far more common between

the bands of disjunction and the region of the Y sutures, and were more numerous anteriorly than posteriorly. Not uncommonly the opacities arranged themselves in concentric layers surrounding the nucleus. These opacities are regarded as precursors of peripheral concentric lamellar opacities in the senile lens, a true form of senile cataract. At times punctate opacities of unusually small size are present in the anterior cortical suture-system.

The author concludes that punctate opacities, which are found in nearly all adult lenses, increase in number with the age of the subject. As a sign of aging of the lens, they precede nuclear relief, increase in the elementary stripes composing the adult nuclear band, and yellowing of the nucleus. (3 figures, references, complete detailed table.)

R. W. Danielson.

Kronfeld, P. C., and Haas, J. S. **Glaucoma due to peripheral anterior synechias after operation for cataract.** Arch. of Ophth., 1945, v. 33, March, pp. 199-202; also Trans. Amer. Ophth. Soc., 1944, v. 42. (See Section 8, Glaucoma and ocular tension.)

Neff, E. E. **Factors affecting hemorrhage following extractions of cataracts.** Arch. of Ophth., 1945, v. 33, March, pp. 192-198; also Trans. Amer. Ophth. Soc., 1944, v. 42.

Ninety-eight patients upon whom a total of 205 operations were performed are considered in detail. The papers of Knapp. Wheeler, Vail, Gradle and Sugar, DeVoe, and others are discussed. The author's work seems to confirm the conclusions of others that age, systolic and diastolic blood pressure, anemia, platelet level, bleeding time, coagulation time, results of tourniquet tests, and the existence of diabetes or nephritis are not significant factors for anticipating the occurrence of postoperative hemorrhage.

The greatest frequency of hemorrhage was with combined intracapsular extraction, the incidence of bleeding being 20.6 percent, in contrast with 7.8 per cent for intracapsular extraction after preliminary iridectomy. There were hemorrhages only in 3.2 percent following preliminary iridectomy. The total incidence of hyphemia for the whole series was 11.2 percent. Trauma was known to be instrumental in 48 percent of the cases of hemorrhage. These results substantiate the theories of Wheeler and Vail that trauma and type of operation are two important factors influencing postoperative bleeding. (3 tables, references.)

R. W. Danielson.

Páez Allende, Francisco. **Concerning a case of spontaneous and complete dislocation of a clear lens into the vitreous.** Arch. de Oft. de Buenos Aires, 1943, v. 18, March, p. 171.

A case of spontaneous dislocation of a clear lens into the vitreous. The patient was a woman aged 82 years. The author discusses briefly the prognosis, frequency, and etiology of the condition. (Bibliography.)

Plinio Montalván.

Pimentel, P. C. **New procedure for intracapsular extraction of cataract.** Rev. Brasileira de Oft., 1945, v. 3, March, pp. 137-142.

The author has designed, and has used in a few cases, a wire loop curved into a hook at the extremity. The corneal flap is lifted with one of the angles of the loop, which is then passed between the cornea and the lens to the lower border of the latter, sliding the iris downward, and being insinuated

between the equator of the lens and the ciliary processes so as to break the lower fibers of the zonula. If the zonula is too resistant, a slight lateral movement is sufficient to break it. As the lens rises on the arms of the loop, the handle of the instrument is brought forward so as to depress its extremity, the slight pressure thus made on the vitreous bringing the upper border of the lens forward. Various possible complications of the technique are discussed. In the limited number of cases in which this technique was employed, extraction was complete and without loss of vitreous. (8 illustrations.)

W. H. Crisp.

10

RETINA AND VITREOUS

Amenábar Prieto, Mario. **Clinical and technical considerations on retinal detachment.** Arch. de Oft. de Buenos Aires, 1943, v. 18, March, p. 135.

The author makes an exhaustive study of 22 cases of retinal detachment, the histories of which are given in detail. Both direct and indirect ophthalmoscopy were used in the preoperative examination. The greater number of tears were found in the outer half of the retina, the frequency being higher in the supero-external quadrant. Tears were multiple in 40 percent of the cases. The author considers as important elements of prognosis and cure the trial binocular bandage, rest in bed, intraocular tension, the response to atropine, and the condition of the vitreous. He also uses a modified transillumination method for localizing the tear. After the tear is visualized with an ophthalmoscope by ordinary light, a transilluminator is introduced through the conjunctival incision and passed over the zone of the sclera corresponding to the location of the tear. At this moment the illumination of the ophthalmoscope is changed to red-free light and the tear appears as a dark-red spot in a blue background. With good localization a minimum number of diathermy punctures are required.

The lowest intensity of current possible is used, giving preference to surface coagulation, and only using penetrating diathermy when strictly necessary. If a detachment recurs because of weak diathermic coagulation, it may be cured by a second intervention. On the other hand, if the recurrence is due to excessive coagulation, a second operation will make the condition worse. Since retinal detachment is not often corrected with one operation, the need for further surgery must not be interpreted as a sign of failure. The author considers the following as criteria for cure: complete sealing of the tear, improvement in the fundus picture, and marked improvement of both visual acuity and fields, maintained during an observation period of three months.

Plinio Montalván.

Ballantyne, A. J. **Retinal changes associated with diabetes and with hypertension.** Arch. of Ophth., 1945, v. 33, Feb., pp. 97-105.

The retinal changes with diabetes and hypertensive diseases are separate entities, both clinically and histologically. The earliest demonstrable changes in both conditions occur in the vessels, venous changes in diabetes and arterial alterations in hypertension.

In diabetes these changes point to venous stasis. In addition to the hemorrhages and exudates, they consist of congestion of the veins, microaneurysms on the capillaries, and gross

changes in the principal veins. The microaneurysms may occur alone and seem to be the earliest abnormal change in the diabetic fundus. They may be mistaken for minute round hemorrhages. The earliest histologic change takes the form of minute fatty granules in the vascular endothelium, together with swelling of the endothelial cells. In hypertension fatty granules are observed more frequently in the media and adventitia. The retinal veins of the diabetic patient show expansions, beading, and the formation of loops, coils, and networks, and the predominant histologic changes are phlebosclerosis and intraretinal and preretinal networks of large, thin-walled vessels. Hemorrhages in diabetic retinal disease are usually rounded and occur primarily in the central area of the fundus, chiefly in the internuclear layer.

In hypertensive disease, arterial changes predominate. The hemorrhages are primarily circumpapillary and striate, owing to their superficial situation in the nerve-fiber layer. Exudates may occur in the deep layers but also include patches of ganglioniform degeneration in the nerve-fiber layer.

Possibly both forms of retinopathy result from toxic factors acting on the blood vessels. These factors may be specific to hypertension or to diabetes and the differentiation of the two forms of retinal changes may be due to selective action on the walls of the capillaries and larger vessels. (8 figures, references.) John C. Long.

Barraquer Moner, J. I. **Instruments and technique for operation on detachment of the retina.** Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, March-April, pp. 211-218.

A detailed description of the operation for retinal detachment, using surface diathermy and punctures by catholysis. (10 illustrations.)

J. Wesley McKinney.

Busacca, Archimede. **A view of the normal fovea and macular region through the stereoscopic ophthalmoscope.** Anales Argentinos de Oft., 1944, v. 5, Jan.-Feb.-March, pp. 8-12.

This follows a report presented about one year ago. The fovea is visualized as a distinct dark-red central disc, 3 to 5 mm. in diameter, with linear light reflexes passing over to the grayish-red of the macula. At times this area of the fovea seems to contain rose or yellow granules which may be attributed to the underlying choriocapillaris. If the granular appearance becomes very marked it may be considered pathologic. Occasionally a gauzy transparent tissue over the central fovea aids us in appreciating the cup shape of the fovea —a definite difference in level between the anterior and posterior parts being visualized. The author feels there is no true foveola. Foveal variations noted are changes in depth of color, pigment, and light reflex. The perifoveal region extends for 1 to 1.5 mm. around the central foveal disc, is grayish-red in color, and has a metallic reflex. This area, too, has a yellowish granular appearance. No conclusive statement can be made concerning the reason for the yellow color of the macula.

Edward Saskin.

Leopold, I. H. **Intravitreal penetration of penicillin and penicillin therapy of infections of the vitreous.** Archives of Ophth., 1945, v. 33, March, pp. 211-216. (See Section 2, Therapeutics and operations.)

O'Malley, C. L. C. **Spontaneous retinal and vitreous hemorrhages in young adults** (Eales's disease). Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 395-402.

The author reviews the history of this subject, and reports five cases.

Many causes have been cited, but in later years tuberculosis has often been observed in eyes removed later for secondary glaucoma. The author presents a review of some of these cases and of the experimental work done. He reports eight such cases, with the ocular and general physical findings. (2 tables, references.)

Beulah Cushman.

Pischel, D. K. **The basic principles of retinal detachment operations, with special reference to the eyeball shortening operation.** Trans. Amer. Acad. Ophth. and Otolaryng., 1945, 49th mtg., Jan.-Feb., pp. 155-171.

Retinal detachments are classified thus: (1) so-called idiopathic or simple detachments and those caused by direct trauma to the eye, which are all considered operable; (2) those due to more or less dense strands in the vitreous, pulling the normal retina from its base; of which a few are operable by special procedures; (3) those caused by intraretinal hemorrhages, which are rare and heal spontaneously; (4) those due to formation of so-called pathologic subretinal fluid, in which healing depends on removal of the underlying cause; (5) those caused by neoplasms, to be cured by enucleation. Fundamental in the operative treatment of all detachments are the following considerations: Detachments are caused by one or more holes or tears in the retina. They tend to be spread by the normal rotations of the eyes. To cure a detachment, the hole or tear must be closed or walled off from the rest of the fundus by a solid line of water-tight chorioretinal adhesions.

Any operative cure of retinal detachment must produce an exudative choroiditis, at that point to which the tear in the retina will be brought as the retina settles down. The retina must be allowed to settle back to its normal position and remain there long enough for the tear to touch this exudate and be sealed by it. The subretinal fluid must be drained away, allowed to absorb, or both. The operative technique which best accomplishes these purposes will result in the highest percentage of cures. Diathermy is easy to use, its amount can be varied simply, and the apparatus required is not complicated. Direct visual control during the operation is emphasized.

In difficult and unusual cases special procedures are often required. In aphakic eyes, diathermy seems to have a tendency to make the vitreous shrink. Here, Lindner's undermining operation may be the operation of choice. In eyes in which the detached retina has become too small to fit the interior of the eye, the operation of scleral resection is advised. Its technique is described in detail. The operation should be reserved for desperate cases and performed before degenerative changes are advanced. The percentage of cures obviously will be small.

Charles A. Bahn.

Terry, T. L. **Retrolental fibroplasia in premature infants.** Arch. of Ophth., 1945, v. 33, March, pp. 203-208; also Trans. Amer. Ophth. Soc., 1944, v. 42. (See Section 13, Eyeball and orbit.)

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Alcaino, Alfredo. **Surgery of the optic canal.** Rev. de Otorrinolaringologia (Chili), 1942, v. 2, Sept., pp. 39-51.

The author first describes the anatomy of the optic canal, with special attention to the anatomic characteristics of the orbital circulation. Reference is made to the frequency and mechanism of involvement of the optic nerve in the traumatisms of the cranium; to orbito-ocular symptoms of orbital fractures; to the pathogenesis of intracanalicular lesions of the optic nerve; and to radiography of the optic canal. Worms's surgical method of approach to the optic canal is described, as originally published in Archives d'Ophtalmologie, 1932, April. The author further describes briefly seven cases in which the optic canal was approached by this technique.

W. H. Crisp.

Livramento Prado, Durval. **Syphilis and the optic nerve.** Arquivos Brasileiros de Oft., 1944, v. 7, nos. 4 and 5, pp. 164-177.

With the aid of ten fundus photographs in black and white, the author reviews the following manifestations of syphilis in the optic nerve: optic neuritis, retrobulbar neuritis, disturbances of papillary vessels, gumma, papillary ectasia, and atrophy of the nerve. Two illustrative clinical cases are reported under disturbance of the papillary vessels, two under gumma, and one under papillary ectasia. The subject of systemic treatment is discussed.

W. H. Crisp.

Weskamp, Carlos. **Optic atrophy from chiasmal arachnoiditis.** Anales Argentinos de Oft., 1944, v. 5, Jan.-Feb.-March, pp. 1-7.

Weskamp states that the usual causes of optic atrophy, such as toxic and medicinal factors, hypophyseal tumors, new growths of the sella turcica and vicinity, gliomas or craniopharyngiomas, and syphilis, can be determined readily. In certain cases of progressive optic atrophy leading to blindness, with no demonstrable etiologic factor, chiasmal arachnoiditis, frequently luetic, must be considered strongly, especially since this condition can be relieved by operation. Three cases are reported, only the first being presented completely to the reader. All cases were of simple atrophy of the papilla with no causative factor in evidence. A diagnosis of chiasmal arachnoiditis was corroborated by operation in one instance, but no follow-up is given. Edward Saskin.

12

VISUAL TRACTS AND CENTERS

Ecker, A. D., and Anthony, E. W. **Head injuries from the ophthalmologist's viewpoint.** Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 43-48.

The neurologic basis for several ophthalmic syndromes with closed head-injuries is presented. The fixed, dilated pupil of Hutchinson is an infallible sign of raised intracranial pressure, usually due to a laterally placed intracranial lesion of the same side, which is most often in the temporal but may be in the frontal or parietal lobe. The pupillary change is caused by herniation of the medial part of the temporal lobe into the tentorial notch. The underlying lesion may be a hematoma of any type or even contusion and swelling of the brain.

Bilaterally dilated fixed pupils soon after head injury, with neurogenic hyperthermia, rapid pulse, quickly rising rectal temperature, cold skin, and decerebrate rigidity, indicate damage to the mid-brain and a bad but not hopeless prognosis. Argyll-Robertson pupils of traumatic origin may result from lesions either in the central nervous system itself or in the peripheral efferent pathway to the pupil.

In the study of lesions of the temporal lobe, ventriculograms and cerebral angiograms, as well as studies of the visual fields, speech, electro-encephalograms, and caloric nystagmus, can be used. The amount of cerebral damage can be estimated by means of the electro-encephalogram, which is also helpful in the diagnosis of hysteric amblyopia. Directional preponderance of caloric nystagmus to the side of the lesion is present when the temporal lobe alone is involved.

The location and nature of the neural lesion in any muscular palsy can roughly be determined by the length of time required for recovery. In cases of paralysis of one or more ocular muscles, orthoptic exercises should be encouraged, even in a completely paralyzed muscle, because these procedures, acting on the other extra-ocular muscles, will result in passive movement of the affected muscle with improvement in its blood supply. Such activities help prevent atrophy of the affected muscle and contracture of the antagonist while the nerve is regenerating.

Visual-field studies serve to show progressive changes. The presence of normal visual fields does not exclude the possibility of a slowly growing subdural hematoma overlying the optic radiation, since it is actually outside of the brain substance. Thus there is significance in the presence of normal visual fields in a case of suspected subdural hematoma with significant lateral shift of the pineal body or appropriate spinal-fluid changes. (References.) Edna M. Reynolds.

Ironside, R., and Batchelor, I. R. C. **The ocular manifestations of hysteria in relation to flying.** Brit. Jour. Ophth., 1945, v. 29, Feb., pp. 88-98.

The visual aberrations experienced by a normal aircrew under conditions of fatigue, anoxia, and anxious preoccupation are discussed for the purpose of distinguishing them from the grosser, more persistent and more disabling phenomena due to neurosis. Forty cases of hysteria are summarized. Blurred vision, photophobia, diplopia, and defective night vision are the four complaints most common in the series under consideration. The symptoms were out of proportion to any ocular disability found to be present. More than one fourth of the patients showed convergence weakness. From a physical standpoint all the men were fit for the exacting requirements of aircrew duty.

The fact that there is a correlation between the phorias and convergence defects on the one hand and neurotic constitution on the other hand is brought out, although it is made plain that not all heterophorias and defects of ocular convergence are of psychologic origin. Any inherent ocular defect may form the nucleus for any aggregation of hysteric symptoms. From those who develop a hysterical reaction, it is almost always possible to derive a history of personal neurotic traits or a family history of psychopathy, or both. In war time, after a severe traumatic

experience, individuals of relatively sound personality may develop hysteria.

In examining candidates for aircrew duty, an attempt was made to establish a correlation between ocular-muscle imbalance and predisposition to psychoneurotic breakdown. Of ten patients with convergence weakness, four were found to be very considerably and one severely disposed to breakdown. The necessity for finding possible evidence of neurosis is emphasized.

Treatment is considered feasible in cases following a severe traumatic experience and in individuals who have a considerable number of flying hours to their credit. Orthoptic treatment of hysterics is unlikely to be permanently successful. (References.)

Edna M. Reynolds.

Kohut, H., and Richter, R. B. **Neuro-optic myelitis: A clinico-pathological study of two related cases.** Jour. Nerv. and Ment. Dis., 1945, v. 101, Feb., p. 99.

The authors describe two cases of spinal-cord and optic-nerve disease which they consider essentially alike. The dominant features of each are: (1) acute diffuse ascending myelitis associated with optic neuritis and no evidence of destructive changes elsewhere in the nervous system, except for nystagmus in case 1; (2) rapid, straightforward course, fatal in one instance, and without remission or progression in the other; (3) a phase of acute, aseptic, purulent meningitis during the course of the disease. With the exception of a few cases in the literature resembling these and called neuromyelitis optica, other signs of either dissemination or prolonged course with remissions and exacerbations are absent.

On the basis of this the authors feel that it is legitimate to establish these two as cases manifesting an independent entity, rather than to classify them as do Putnam and Foster, as subvarieties of multiple sclerosis. The similarity may be so great that a differential diagnosis is impossible, but, according to the present authors, inclusion of their two cases under the heading of multiple sclerosis would so broaden the term that it would become meaningless.

The pathologic picture obtained from one of their cases likewise differs so from that of either a multiple sclerosis or a disseminated encephalomyelitis as to be likewise an argument against inclusion of the case in these groups. Diffuse, massive necrosis of the spinal cord, coupled with acute degeneration of the optic nerves, in the complete absence of dissemination elsewhere in the central nervous system, constitutes the pathologic complex of this condition.

In the first case a hint of causation was afforded by a recurrent pharyngitis which came on prior to the onset of the disease. The first episode was associated with a "tingling numbness" in both thighs, which disappeared only to reappear with massive involvement of the spinal cord and optic nerves after a recurrence of the pharyngitis. (Microscopic pictures of cord and nerve are given.) Owen C. Dickson.

Pennybacker, Joe. **Papilledema due to intracranial venous obstruction.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 333-338.

A boy nine years of age was admitted with a short history of headaches,

vomiting, amblyopic attacks, and a little unsteadiness in walking. He had a papilledema of 4 to 5 diopters, full fields, and normal acuity. There was no disorder of ocular movements, and no definite neurologic abnormality other than unsteadiness of gait. An exploration was made, with preliminary probable diagnosis of a midline tumor of the cerebellum. No evidence of a tumor was found and the boy died some days later. At autopsy it was found that a tumor of the thymus gland had compressed the innominate vein, causing retrograde thrombosis of the left internal jugular vein, the left transverse sinus, the torcula, and the sagittal sinus.

In another case, similar symptoms, with some weakness of the right external rectus muscle, developed after external trauma with perforation in the occipital area. Two weeks after the injury there was bilateral papilledema, with normal acuity and fields. The ventriculogram and spinal fluid were normal, as was the child's general condition. At the end of two months the papilledema had subsided and the vision was normal.

Thrombosis associated with some infective process such as mastoid disease in which there may be an associated thrombophlebitis of the lateral sinus is probably more common. Progressive thrombosis of cerebral veins may occur as an occasional complication of pregnancy or the puerperium, or of such mild infection as subacute maxillary or frontal sinusitis. (References.) Beulah Cushman.

Rebello Machado, Nicolino. **Visual apparatus in injuries to the head.** Ophtalmos, 1944, v. 3, no. 3, pp. 311-344.

After 13 pages of preliminary considerations, including references to the literature, the author summarizes 11 cases recorded by his colleague, Emilio Navajas, Jr., and continues with rather ample clinical records of 12 personal cases. He concludes with the following comments. Even slight injuries may involve the visual apparatus, especially in children, in whom even severe injuries may present no immediate symptoms. The ophthalmologist should always be called into consultation in such cases. The eye examination should include special attention to alterations in the pupil, avoiding the use of mydriatics. When the fundus appears normal, perimetry and campimetry should be resorted to as soon as possible. In investigating the patient's history as to remote injuries those of obstetric origin should not be ignored. (23 illustrations, references.)

W. H. Crisp.

13

EYEBALL AND ORBIT

Campbell, D. A. **Hereditary microphthalmia in albino rats.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 153-162.

The author presents the histologic appearance of microphthalmos in the embryonic rat eye. The microphthalmos was almost entirely due to markedly subnormal size of the posterior chamber of the eye. The uveal tract, including the ciliary processes and the iris, was thicker than normal. In all cases the retina was thicker, with multiple folds or an overgrowth in the neighborhood of the optic disc. The pigment epithelium was normal. Retinal rosettes were formed by a circle of cells from the outer nuclear layer, lined by the external limiting membrane and by a ring of rods and cones.

In those eyes in which there was a large mass of tissue near the disc, the glial tissue was increased and in some cases continued forward through the vitreous to fibrous tissue on the posterior surface of the lens. In some places no internal limiting membrane was seen, and the inner surface of the retina presented a lacework of glial fibers. In some eyes there was persistence of fibers in the area of the primary vitreous. The lens showed extensive degeneration in every case. (7 illustrations, references.)

Beulah Cushman.

Giri, D. V. **A rare combination of developmental ocular defects in a dwarf.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 148-152.

The single case presented macrocornea, microphthalmia, heterochromia iridis, typical bilateral coloboma of the iris and choroid, coloboma of the disc and macula, concomitant convergent strabismus, and dwarfism. (3 illustrations, references.) Beulah Cushman.

Grünwald S, Enrique. **Ophthalmocavernous thrombophlebitis.** Rev. de Otorrinolaringologia (Chili), 1943, v. 2, March, pp. 161-182.

With report of a series of cases the author associates a discussion of the pathology and symptomatology of this usually fatal disorder. His cases originated in acute purulent infection of the skin of the nasal vestibule, in the cheek, in the iris, and in the forehead. (References.) W. H. Crisp.

Kindred, J. E. **Cyclopia completa and arhinencephalia completa with umbilical hernia in a full-term child.** Arch. of Ophth., 1945, v. 33, March, pp. 217-223.

Description of such a child, born to two Negroes, is correlated with a monographic dissertation on the literature of similar cases.

The monster was of the extremely rare type in which there is absolutely no trace of a nose. Yet aside from this defect and the presence of the cyclopean eye the face showed only a slight degree of abnormality. (2 photographs, references.) R. W. Danielson.

Krafka, Joseph, Jr. **Cyclopia and arhinia.** Arch. of Ophth., 1945, v. 33, Feb., pp. 128-136.

Two cases of cyclopia are described, one of a human infant and one of a kitten. The bones were studied roentgenographically and by the clearing method to determine the role of the premaxillas in lip formation. The current theories on the mechanics of cyclopia are discussed. They fail to disclose the factors responsible for development of various grades of cyclopia and associated oral and nasal defects. The author advances the concept that cyclopia and related defects may be caused by fusion of the two plexuses representing the first aortic arches. Should these plexuses fuse across the midline of the body, they could produce a traction factor against which the optic rudiments, in their movement from the midline, would have to act. This simple mechanical factor could produce conditions capable of bringing about all grades of cyclopia.

With the primary factor of cyclopia once established, a single median eye may be directed toward the head ectoderm at three levels: (1) below the site of formation of the nasal placodes; (2) at the level of the site; and (3) above this level. In the first instance, a nasal snout may develop above the eye and a harelip also be present. In the second instance the snout may lie above the eye and a typical premaxilla and a

tuberculum be present. In the third instance the snout may lie below the eye or be completely suppressed. (5 figures, references.) John C. Long.

Lemos Torres, Ulysses. **The ocular apparatus in hyperthyroidism.** Arquivos Brasileiros de Oft., 1944, v. 7, nos. 4 and 5, pp. 143-163.

The very numerous ocular signs to which the names of various authors have been from time to time attached are briefly described and reviewed, more particularly the following signs: Dalrymple, Berger, Graefe, Kocher, Moebius, Joffroy, and Saenger. A number of these signs are illustrated by means of 16 photographs of patients. (Bibliography.) W. H. Crisp.

Rundle, F. F., and Wilson, C. W. **Asymmetry of exophthalmos in orbital tumor and Graves's disease.** The Lancet, 1945, v. 248, Jan. 13, p. 51.

Statistical study of 21 cases of orbital tumor and 26 cases of Graves's disease showing ophthalmic signs revealed that the presence of unilateral exophthalmos in Graves's disease is not uncommon. A 6-mm. difference in symmetry as determined by the Hertel exophthalmometer was never exceeded. As to tumors on the other hand, this figure was exceeded by 80 percent of the cases. Early attendance at a hospital by tumor patients would obviously make such a general statistical approach invalid.

From experiments on the degree of proptosis produced by injection of wax retrobulbarly post mortem, a curve was established indicating in the early stages an exophthalmos of 1 mm. for each 0.75 c.c. increase in bulk. Above this the ratio was almost 1 mm. per c.c. This affords a relatively accurate estimate of bulk of retrobulbar tumors. Applying this to the series, it was found that the average volume of tumors was 7.5 c.c., with an approximate range of 3.3 to 14.0 c.c. In ophthalmic forms of Graves's disease, the average bulk excess on one side was 1.6 c.c. with an upper limit of 4.3 c.c.

Owen C. Dickson.

Terry, T. L. **Retrolental fibroplasia in premature infants.** 5. Further studies on fibroplastic overgrowth of persistent tunica vasculosa lentis. Arch. of Ophth., 1945, v. 33, March, pp. 203-208; also Trans. Amer. Ophth. Soc., 1944, v. 42.

This is the fifth paper in a series of studies by the author. In the cases in this study it has been observed that when no complications arise the opaque tissue making up the retrolental fibroplasia usually becomes less dense, so that in places a red reflex can be obtained and in some instances the fundus can be observed in detail. The edges of the opaque tissue may appear sharp, but usually when viewed with a slit-lamp the fibrillae are gradually reduced in number and density and finally disappear, like the edge of a fleecy cloud.

With favorable development, the searching nystagmus so typical early in the disease tends to abate and even disappear, and internal strabismus develops frequently. In most of the patients the improvement has been only moderate. Although it is apparent that infants with this condition are conscious of light stimulation and that some of them see relatively large objects which present great contrast, there is no evidence of ability to judge distance, because these infants never reach for the objects, as do seeing infants of the same age.

There seems to be no correlation between retrolental fibroplasia and

retardation in mental development of premature infants. Development of glaucoma was observed in five cases. There is a strong tendency toward development of posterior synechia. In an attempt to prevent this, a mydriatic which is effective for only a few hours was used once each week.

The original concept, that the disease arises through hypertrophy of the intraocular vascular system because of a precociously high blood pressure resulting from premature birth, seems less tenable as the factors are examined more minutely.

In approximately 12 per cent of all premature infants weighing three pounds (1,307 gm.) or less at birth retrolental fibroplasia develops. Occasionally, cataractous development may obscure deeper ocular changes. The "fetal blue" color of the iris persists longer, its speed of disappearance being in direct proportion to the rapidity of growth of the involved eye. Radiation therapy has proved to be valueless, or in fact more damaging than beneficial.

The more tenable theory of the cause of this anomaly is that failure of production or accumulation of aqueous humor may be caused by precocious exposure to light, activating the musculature of the iris and ciliary body before the hyaloid vascular system has disappeared. A surgical attempt to establish new vascular connections between the ciliary body and the episclera, by scleral trephining over the ciliary body, appears to produce some improvement. (3 figures, references.)

R. W. Danielson.

14

EYELIDS AND LACRIMAL APPARATUS

Amendola, Francisco. **The presence of leprotic lesions in the lacrimal gland.** Arquivos Brasileiros de Oft., 1944, v. 7, nos. 4 and 5, pp. 177-179.

Brief description of a clinical case is accompanied by a good photomicrograph showing the lacrimal gland with interstitial lepromatous infiltration. According to the writer, the lacrimal gland is almost always the seat of specific lesions in cases of leprosy, and extirpation of the gland is frequently very beneficial to the patient. In only three out of twenty cases in which the gland was extirpated were the micriscopic findings negative for leprosy.

W. H. Crisp.

Law, F. W. **Acute recurrent lacrimal diverticulitis.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 295-301.

A patient 18 years of age had repeated attacks of acute dacryocystitis which discharged through the skin. Three weeks after the first attack the duct was syringed and was found to be freely and painlessly patent. After the second attack five months later, the passages being still patent, the author made a diagnosis of diverticultis.

Roentgenograms made with opaque substances confirmed the diagnosis. The diverticulum was dissected out and the sac was again found patent. Several months later another attack of dacrocystitis with patent ducts led to diagnosis of another diverticulum. This second diverticulum was found to be posterior. After its removal the ducts and sac remained patent. (3 figures.)

Beulah Cushman.

Pereira, R. F. **Mycotic lacrimal canaliculitis.** La Semana Méd., 1945, v. 52, Feb. 8, pp. 284-287.

The author has seen five cases of this condition in the course of 17 years. The clinical picture is dominated by

suppuration, and in the early stages the disease is easily confused with chronic catarrhal conjunctivitis. Three cases are described in detail. In one of these one eye only was involved, in the other two cases both eyes. The author favors slitting of the canaliculus, although not in its entire length, and curettement of the lining. Various incidental organisms are found, but special technique is necessary in order to show the fungus. In the author's three cases, the organism belonged to the subfamily Mycotoruleae (genus candida). (One illustration, references.) W. H. Crisp.

Strada, F., and Maffrand, R. A. **Supernumerary lacrimal caruncle.** Arch. de Oft. de Buenos Aires, 1943, v. 18, Feb., p. 63.

The authors report the case of a 40-year old man who showed in the lower tarsal conjunctiva of the left eye, 2 mm. below and to the temporal side of the lacrimal punctum, a small mass similar to but slightly smaller than the normal caruncle, with many whitish papillae and short white hairs over its surface. Histologic examination confirmed its similarity to the normal tissue of the caruncle. This patient had other stigmata, such as deafness and arrested mental development. The authors discuss the rarity of the condition, of which they have been able to find only six cases reported in the literature. (Illustrations, bibliography.) Plinio Montalván

Torres Estrada, A. **Simplified technique for dacryocystorhinostomy.** Jour. Internat. College Surg., 1944, v. 7, March-April, pp. 147-159.

The author recommends, and describes in great detail, his personal method of external dacryocystorhinostomy, for which he claims much greater simplicity and brevity than is possessed by the Dupuy Dutemps operation. The suture between the interior of the nose and the wall of the sac is introduced via the endonasal route combined with an external approach. The article is splendidly illustrated, 19 of the 26 illustrations being pen-and-ink drawings to show the ten steps of the operation. W. H. Crisp.

Wetzel, J. O. **Dacryocystitis: the part played by syphilis in its etiology.** Amer. Jour. Ophth., 1945, v. 28, May, pp. 511-516. (Bibliography.)

15

TUMORS

Benedict, W. L. **Diagnosis of orbital tumors.** Jour. Amer. Med. Assoc., 1944, v. 126, Dec. 2, p. 880; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1944, 94th mtg.

This article is packed with information and cannot be completely abstracted. Tumor of the orbit produces exophthalmos. There is usually lateral displacement of the globe, unless the tumor arises in the nerve or the posterior third of the orbit. If exophthalmos is bilateral the case is usually one of hyperthyroidism or Mikulicz's disease. Visual loss is diagnostically of great importance only when it occurs early in the disease, bespeaking a lesion either near the optic foramen or in the nerve itself. Bruit and thrill over the orbit are diagnostic of arteriovenous aneurysm. Lesions about the optic chiasm, such as pituitary tumor, may cause obstruction to blood flow through the cavernous sinus, resulting in some exophthalmos. Loss of visual acuity with preservation of peripheral field strongly indicates posterior orbital

or chiasmal lesions. Pressure on the posterior globe may produce wrinkling of the retina. X ray is often helpful in diagnosing osteomas, or the hyperostosis of the sphenoidal ridge in intracranial meningiomas. Erosion of the orbital walls may indicate pulsating aneurysms and pyoceles of the sinuses.

The author stresses the fact that retrobulbar exploration with a trochar is diagnostically useless, and is very dangerous if the condition be malignant or an aneurysm. Digital exploration is also useless. Exploration for diagnosis should only be done through an incision so large and so placed that if a removable tumor be found it can be taken out at once.

Robert N. Shaffer.

Hughes, E. B. C. **Selected cases illustrating the value of quantitative perimetry in neurosurgical diagnosis.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 143-146.

The value of quantitative perimetry is emphasized by the author in cases demonstrating typical defects of chiasmal interference, retrobulbar tumor, acquired tritanopia, and neoplasm in the posterior fossa. (Fields.)

Beulah Cushman.

Hughes, L. W., and Ambrose, A. **Retro-orbital adrenal rest tumor.** Jour. Amer. Med. Assoc., 1944, v. 126, Sept. 23, p. 231.

A woman aged 21 years complained of exophthalmos progressive for five years. She had been struck in the eye with a hard snowball at about the time of onset of the condition. A retro-orbital tumor was removed surgically. It was roughly the size and shape of an olive and was encapsulated. Microscopic examination led to the diagnosis of an adrenal rest. Robert N. Shaffer.

Laborne Tavares, C., and Tarcisco Castro, J. **Cornu cutaneum of the upper lid.** Ophtalmos, 1944, v. 3, no. 3, pp. 259-261.

The patient was a woman aged 91 years, who came complaining that for about a year she had had a small hard tumor in the upper lid. The horn was about 20 mm. long, slightly flattened in the anteroposterior relation, its proximal one-fourth forming a broad base attached by a pedicle to the middle third of the anterior surface of the lid midway between the orbital sulcus and the ciliary border. It was curved in such a way as to touch with its free lower end the pupillary area of the cornea. (2 illustrations.) W. H. Crisp.

Rundle, F. F., and Wilson, C. W. **Asymmetry of exophthalmos in orbital tumor and Graves's disease.** The Lancet, 1945, v. 248, Jan. 13, p. 51. (See Section 13, Eyeball and orbit.)

16
INJURIES

Bonsib, R. S. **Ocular lesions due to industrial toxic compounds.** Sight-Saving Review, 1943, v. 13, no. 4, p. 257. (See Section 18, Hygiene, sociology, education, and history.)

Bromley, J. F., and Lyle, T. K. **An apparatus for localizing foreign bodies in the orbit.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 164-176.

The instrument described can be used at the bedside of the patient. It requires a minimum effort of coöperation. The only "X-ray generating set" necessary is the simplest type of portable unit.

A stereoscopic pair of films are made, with a "known opaque body" introduced in relation to the anterior plane of the cornea on the affected side. All

calculations are reduced by graphs. (7 figures.) Beulah Cushman.

Carlisle, J. M. **Industrial first aid in chemical injuries of the eye.** Sight-Saving Review, 1943, v. 13, no. 4, p. 277. (See Section 18, Hygiene, sociology, education, and history.)

Carson, L. D. **Ocular effects of altitude flying and of deep-sea diving.** Arch. of Ophth., 1945, v. 33, March, pp. 173-176.

This paper deals with changes brought about by alterations in atmospheric pressure and oxygen pressure, by rapid and severe changes in temperature, and by protection of the eyes against glare, air blast, dust, and flying débris.

The physiologic effects of variations in pressure express themselves in the following ways: by increase or decrease in oxygen pressure; by rapid decompression of the envelope of air around the earth, resulting in escape of inert gases from solution in bodily fluids and tissues in the form of bubbles, or air emboli; and through the toxic effects of oxygen.

Certain effects of even slight or low-grade anoxia are reflected in vision to some degree. Prolonged flight at an altitude of 8,000 to 10,000 feet (2,600 to 3,300 meters) causes slight but measurable impairment of retinal response, such as can be demonstrated by diminished perception of low-contrast images, increased threshold of light sensitivity as demonstrated by the adaptometer test, and impaired flicker-fusion response. Slight anoxia has such a definite effect on the sensitivity of the retinal rods that military fliers are advised to cut in their supply of oxygen from the ground on up in combat flying at night. In runs in the low-pressure chamber to simulated high altitudes without added oxygen, reduction in visual acuity has been observed in 28 to 65 percent of persons tested; color vision has also been impaired. Diminution of sensitivity to red is less than to green or to blue. Even mild anoxia has been shown to cause a considerable increase in the total area of the normal blind spot. In "ascents" in the low-pressure chamber to the equivalent of 19,000 feet (6,000 meters), the area of the blind spot has been found to increase as much as 2½ times. Diplopias, scotomas, and amaurosis occasionally result from sudden reduction of pressure and release of inert gases from saturation.

At upper atmospheric levels severe sunburn frequently occurs because of exposure to ultraviolet rays. But it has been generally observed that the tolerance of the unprotected eye is apparently considerably greater than that of the skin and of the mucocutaneous junctions. Goggles should be comfortable, should give adequate protection from flying material, and be non-shatterable, and should be well integrated with the oxygen mask. A wide view is essential. An interesting discussion by Berens is based on experiences in the first World War. (1 reference, 1 graph.)

R. W. Danielson.

Cogan, D. G., and Grant, W. M. **An unusual type of keratitis associated with exposure to n-butyl alcohol (butanol).** Arch. of Ophth., 1945, v. 33, Feb., pp. 106-109.

Butanol, to which have been added varying amounts of diacetone alcohol and denatured alcohol, was used as a solvent in cementing waterproof raincoats. It is apparently capable of causing a typical and hitherto undescribed ocular lesion. Thirty-five women engaged in the cementing process were

examined for evidence of ocular disturbance, and 28 were found to have characteristic and symmetrical corneal lesions. The outstanding symptoms were foreign-body sensations, epiphora, and burning. Less regularly noted were blurring of vision with itching and swelling of the lids. Only occasionally had the patients noted redness of their eyes.

Usually no corneal change could be seen without the slitlamp, but in the more severe cases a slight haziness could be detected grossly on oblique illumination. Uniformly the epithelium was studded with fine dots, which appeared gray with direct illumination but upon transillumination were seen to be clear vacuoles. They were limited to the palpebral fissure and were especially numerous in the central portion of the cornea, and varied in number from between 10 and 20 in the mild cases to between 500 and 1,000 in the severest. Only rarely was there any punctate staining with fluorescein. When the patients were away from work, the corneal changes improved considerably in five to seven days and, even in the most severe instances, were completely resolved within ten days. Upon re-exposure the corneal changes reappeared within a few days.

The butanol-vapor concentration of the air was determined in various sections where the affected persons were working, and was found to vary from 15 to 100 parts per million. The maximum concentration corresponded to the area with the largest number of affected employees. The obvious therapy is improved ventilation in the plants. Attempts to produce characteristic lesions by exposure to high concentrations of the vapor failed when mice, guinea pigs, rabbits, and dogs were used as subjects. (References.) John C. Long.

Davidson, W. G., and Burn, J. K. A. **Gas-gangrene infection of the eye and orbit.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 375-377.

A patient with multiple wounds due to explosion of a hand grenade received a small perforating injury of the eye and a deep one in the orbit. Expectant treatment seemed to be satisfactory for four days, but it then proved necessary to enucleate the eye. There was no odor from the orbit, but an odor was obtained when the sclera was opened. Antigas serum was given intravenously and intramuscularly. The next day the orbital tissues were tense and swollen and blood-stained fluid trickled through the orbital wound. X-ray examination of the skull showed circular areas which were interpreted as bubbles of gas deep in the orbit. Complete exenteration of the orbit was done and the patient recovered promptly. Beulah Cushman.

Neame, Humphrey. **A case of mustard gas keratitis treated with curettage of the cornea for the removal of a band-shaped crystalline deposit.** Brit. Jour. Ophth., 1945, v. 29, Feb., p. 102.

A transverse band across the pupillary area of the cornea, composed of a superficial deposit of glistening crystalline appearance, was curetted under local anesthesia in a patient aged 56 years, with a severe mustard-gas keratitis. The cornea healed uneventfully, and with a contact glass the vision was improved from 6/60 to 6/36. The case is reported because such corneas have been considered unsuitable for operation, by reason of their tendency to recurring ulceration.

Edna M. Reynolds.

Rycroft, B. W. **Penicillin and the control of deep intraocular infection.**

Brit. Jour. Ophth., 1945, v. 29, Feb., pp. 57-87.

As a result of experience in three campaigns, the following measures are recommended for the prevention of ocular infections: provision of anti-mine visors for selected troops; early attention to ophthalmic cases by forward general surgeons; early magnet applications and removal of intraocular foreign bodies from entry wounds, excision of prolapses and closure of wounds by skilled ophthalmic surgeons, insufflation of powdered calcium penicillin in every case of penetrating wound of the eye, air evacuation to a base ophthalmic wing. On arrival at a base ophthalmic wing, the following special measures are taken: complete radiographic investigation and localization followed by surgical removal of intraocular foreign bodies, sulfonamide therapy, nonspecific foreign-protein therapy, penicillin therapy, surgical treatment.

For metallic intraocular foreign bodies, direct magnet approach is used. Superficial stony foreign bodies which can be dislodged readily are removed and the wounds are carbolized. This procedure has to be repeated as the case progresses. All cases of intraocular foreign body are given a course of sulfonamide therapy as a routine. A total of 37 gms. is given at four-hour intervals for three days. Sulfathiazole is the drug of choice except where there is reason to believe that the skull has been opened, in which case sulfadiazine is preferred because of its excretion into the cerebrospinal fluid.

For nonspecific foreign-protein therapy T.A.B. vaccine is preferred. An initial dose of 50 to 75 millions is given and this is repeated after three days. More than two doses are rarely required. Heavier doses may produce herpes of the cornea. Protein shock is never given coincidentally with a course of sulfonamides, because the sweating which results from the protein shock may cause dangerous concentration of sulfonamides in the urine.

As a result of widespread use of penicillin in ocular conditions, the following conclusions have been reached: (1) Penicillin is of great value for superficial infections of the conjunctiva and orbits. (2) Penicillin effectively prevents infection of the conjunctiva when used early after operation. (3) Its routine application by forward ophthalmologists results in the arrival of cleaner eyes at the base. (4) Penicillin has no great value in the treatment of corneal ulcers unless these are secondary to conjunctivitis. For superficial infections of the eye the value of penicillin is well proved but for deep infections its role is preventive rather than curative.

Experiments aimed at obtaining information as to whether penicillin enters the media of the eye when given by intramuscular injections were carried out with moribund patients. It was found that when penicillin was injected intramuscularly it did not pass into the eye in amounts sufficient for detection. Direct injections of sodium-penicillin solution (1,000 units per minim) into the aqueous or vitreous were not found to influence the course of deep infections of the eye. (5 diagrams, tables, references.)

Edna M. Reynolds.

Scherling, S. S., and Blondis, R. R. **The effect of chemical-warfare agents on the human eye.** The Military Surgeon, 1945, v. 96, Jan., p. 70. (See Amer. Jour. Ophth., 1945, v. 28, May, p. 571.)

Stern, H. J. **Transparency of the lens following traumatic cataract.** Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 48-50.

The author reports a case of anterior capsular cataract in a West African Negro aged 25 years, whose left eye had been injured by a flying particle of stone. The uninjured eye showed a similar cataract. Both fundi were clearly visible and vision was 6/6 in both eyes several hours after the injury to the left eye. The only injury found at that time was a corneal abrasion of the left eye. Three days later, the patient returned with complaints of violent pain in the injured eye. A brilliant white mushroom-shaped mass was seen protruding from the lens into the anterior chamber. There was marked ciliary injection and the intraocular pressure was 40 mm. Hg. X ray of the eye showed no radiopaque body. The tension could be lowered by massage and hot applications. On the sixth day, the opaque lens masses had markedly diminished in size, and by the following day they were less than half the original size. The normally transparent lens was visible behind them. Thirteen days after the injury only a few fine grey capsular opacities were left, surrounded by brown iris pigment. At this stage, a feathery posterior capsular cataract was observed, the vision being 6/60. This cleared up almost completely and on the 23rd day the eye was again white and perfectly normal except for the unchanged anterior capsular cataract and a fine central corneal opacity. With the slitlamp, fine linear opacities could be seen in the anterior capsule. Vision was 6/6 and retinoscopy revealed emmetropia.

The difficult features to explain in this case are the delay of three days in the appearance of the lens masses in the anterior chamber, the complete closure of the tear in the capsule after the loss of cortex, and the normal refraction after absorption of part of the lens. (5 figures.) Edna M. Reynolds.

Tisher, P. W. **Industrial injuries of the eye caused by flying objects.** Arch. of Ophth., 1945, v. 33, Feb., pp. 152-154.

Corneal foreign bodies of the so-called hot-chip type encountered in grinding vary in their characteristics with the promptness of treatment. If seen very early, the foreign body may be cleanly removed leaving only a small corneal defect. If removal is delayed, a rust ring will be present which requires thorough removal. If seen still later, there may be an infected crater. The author does not patch most eyes after removal of a foreign body. If the crater is infected, sulfadiazine powder may be applied directly to it.

The author describes ocular injuries resulting from a blow to the eye or adnexa. Intraocular foreign bodies are briefly discussed. In each case of ocular injury the vision should be recorded with and without glasses and a careful study of the fundus made. The ideal program would be to have the visual status of every employee recorded before beginning employment. This would result in the most efficient job placement and would also serve for estimating liability in case of an accident. John C. Long.

17

SYSTEMIC DISEASES AND PARASITES

Ameriso, José. **Oculo-orbital complications of sinusitis.** Rev. de Otorrinolaringologia (Chili), 1944, v. 3, March, pp. 213-221.

Five clinical cases are reported. The

conditions presented were as follows: right pansinusitis with foci of osteomyelitis of the superior maxillary bone; chronic right pansinusitis not submitted to operation in a patient aged 62 years; right pansinusitis and a pyocele of the frontal sinus on the same side, with exophthalmos; orbital cellulitis in a boy of 11 years, arising from acute antro-ethmoiditis. (2 illustrations.) W. H. Crisp.

Boshoff, P. H., and Grasset, E. **Two unusual tuberculomas.** Arch. of Ophth., 1945, v. 33, March, pp. 209-210.

Two cases are reported in South African Negroes. The first involved the conjunctiva and developed after an injury to that structure. The second is unusual in that an intraocular tuberculoma eroded through the sclera and ruptured externally with resulting degeneration of the eyeball. (2 figures, references.) R. W. Danielson.

Gregory. **A résumé of ophthalmic findings in nutritional investigations.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 316-320.

The author reports on eye findings in vitamin deficiencies as found in routine examination of 898 patients, from town and country, from factories, some medical and college students, some members of a boys' institution, and some pregnant women. Twenty-five of the number had vascularization of the cornea compatible with ariboflavinosis. Forty-six showed wrinkling of the conjunctiva and poor dark adaptation as part of a probable vitamin-A deficiency. The pregnant women appeared excellently nourished. Of the whole group, less than 2.5 percent showed probable ariboflavinosis and a still smaller percentage showed any vitamin-A deficiency. (One table, references.)

Beulah Cushman.

Harris, H. J. **Brucellosis.** Arch. of Ophth., 1945, v. 33, Jan., pp. 56-61.

Brucellosis is an infectious disease of manifold symptoms. The eye is one of the many sites of its manifestations, although the disease is rather rarely recognized through its ocular signs. Acute and chronic forms alike are second to no other disease, syphilis not excluded, in the ability to masquerade under innumerable guises. From practically all the tissues of the body, as well as from the blood, spinal fluid, urine, and stool, the organism has been cultured by one or more investigators.

The literature mentions such eye manifestations as recurrent phlyctenular conjunctivitis and corneal ulcer, optic neuritis, iritis, panophthalmitis, choroiditis, papilledema, palsy of ocular muscles, and keratitis. Orloff has commented that the ocular infections associated with brucellosis seem to have great similarity, clinically as well as pathologically, to ocular tuberculosis.

The diagnosis is made by evaluation of multiple procedures including agglutination, intradermal, and opsonocytophagic tests, and culture. Treatment is by sulfonamides, by vaccine, and by immune serum. Penicillin, or other mold derivatives, may ultimately prove to be the uniformly effective agent, although to date these preparations have given no promise of being effective in gram-negative bacillary infections. Three cases of iritis with arthritis, thought to be due to brucellosis, are reported. (References.)

R. W. Danielson.

Heath, P., and Zuelzer, W. W. **Toxoplasmosis.** Arch. of Ophth., 1945, v. 33, March, pp. 184-191.

Toxoplasmosis is a recently recognized infectious disease in human beings. Four principal types have been re-

ported: a granulomatous encephalitis, usually of congenital origin and occurring in fetal or early infantile life; an acquired acute encephalitis occurring in children; an acquired acute disease resembling Rocky Mountain spotted fever, and occurring in adults; a latent subclinical form occurring in adults.

In infants the central nervous system is especially susceptible to toxoplasmic infection. The principle clinical findings are internal hydrocephaly or microcephaly, roentgenographic evidence of focal cerebral calcifications, and bilateral chorioretinitis, which attacks particularly the central area. The pathologic lesion in the central nervous system consists of necrosis followed by calcification and by a tendency to form granulomas. Scattered through the hemisphere and into the white matter are found miliary granulomas with epithelioid cells, and focal meningeal and cerebral inflammatory areas with lymphocytes, plasma cells, glial cells, large mononuclear cells, histiocytes, eosinophiles, some capillary hypertrophy, and conglomerate foci of necrosis, ranging from microscopic dimensions to several centimeters in size. Cavities may be formed. Parasites, intracellular and free, may be seen in affected or clear areas. Calcium forms early and is characteristically present in older lesions.

Complete case reports of infant twins are given. Early ocular lesions were demonstrated and are thought to have originated in the seventh fetal month. The cases demonstrate the destructive affinity of the toxoplasma for young nerve tissue, especially that of the eye.

The conceptional age, the virulence of the parasite and the special susceptibility of tissue may influence the distribution and the severity of the disease. In the future, other parasites may be found to produce lesions similar to those of toxoplasmosis; hence the importance of a study of the parasite. The cases here reported offer strong evidence for transplacental infection. (5 figures, references.)

R. W. Danielson.

Laborne Tavares, C. **Laurence-Moon-Bardet-Biedl syndrome.** Ophtalmos, 1944, v. 3, no. 3, pp. 250-261.

The patient whose case is described in connection with a general discussion of the subject was a man of 46 years, married, a public official, weighing when first treated about 260 pounds, with a divergent squint of the left eye, and complaining of nocturnal blindness from the age of 14 years. The vision of the right eye amounted to counting fingers at 60 centimeters, unimproved by correction; that of the left eye was of shadows close to the face, unimproved by correction. The right eye had a small opacity at the center of the crystalline lens, and the retina was sprinkled with small pigmentary deposits more or less of the type seen in retinitis pigmentosa. The left eye had an irregular opacity of the crystalline lens occupying about the upper third; and the fundus resembled that of the right eye.

The patient's parents were second cousins. One of his paternal grandmothers and one of his aunts had had marked obesity. One of the patient's children had more or less nocturnal blindness. The same defect, with retinitis pigmentosa, was found in two female cousins, and a male cousin had convergent strabismus and congenital cataract. (9 illustrations, 1 genealogic tree, references.) W. H. Crisp.

Lemos Torres, Ulysses. **The ocular apparatus in hyperthyroidism.** Arquivos Brasileiros de Oft., 1944, v. 7, nos.

4 and 5, pp. 143-163. (See Section 13, Eyeball and orbit.)

O'Neill, Hugh. **Total herpes zoster of the ophthalmic, maxillary, and mandibular divisions of the trigeminal nerve.** Arch. of Ophth., 1945, v. 33, March, pp. 237-244.

In relation to the ocular condition there were displayed optic neuritis, exophthalmos, keratitis profunda, and probable mild involvement of the third, fourth, and sixth cranial nerves. No evidence was found for classifying this case as one of symptomatic herpes zoster arising from another intracranial disorder. In view of the severe pain and the cutaneous herpetiform manifestations, the author decided the case was one of idiopathic herpes zoster of the fifth (complete), seventh (partial), and eighth (vestibular) cranial nerves. Three excellent photographs show the vesicular efflorescence in various stages of herpetiform cutaneous response to involvement of the geniculate ganglion and of the ophthalmic, maxillary, and mandibular divisions of the trigeminal nerve. (References.)

R. W. Danielson.

Reese, A. B. **The participation of the eye in general diseases.** Southern Med. and Surg., 1945, v. 107, Feb., p. 61.

The article is one of the Matheson Foundation medical lectures. Uveitis receives the greatest amount of attention. The table on recent etiologic classification shows tuberculosis at the top of the list as cause of 40 percent of the cases, lues 10 percent, sarcoid, brucellosis, and focus of infection each 7 percent, and the balance as due to miscellaneous causes. The diagnosis of tuberculous uveitis is discussed in considerable detail.

Latent in the adult human, toxoplasmosis may be transmitted by the circulation to the fetus and is seen as a congenital infection of infants. Every infant case has shown choroiditis, the macula being especially vulnerable. Microcornea, pupillary membrane, posterior lenticonus, nevus flammeus, and cataract may occur as congenital lesions.

Sarcoid brucellosis and rheumatoid arthritis are important factors in the causation of iritis. German measles and congenital anomalies, particularly congenital cataract, may be closely related.

The author describes Sjögren's syndrome, a keratoconjunctivitis sicca with special characteristics, as seen in some climacteric women and also some elderly women with chronic arthritis. Thyrotoxic and thyrotropic exophthalmos are contrasted. F. M. Crage.

Robertson, J. N. **Ophthalmologic lesions encountered in the tropics, with special reference to the ocular manifestations of malaria.** North Carolina Med. Jour., 1944, v. 5, Oct., p. 483.

Among the effects of malaria on intraocular structures the writer mentions optic neuritis and amblyopia. This is due to the action of toxemia on the optic nerve and retina, and is associated with loss of vision, either transient or lasting from several days to months. Another lesion seen in malaria is extreme pallor of the optic disc, with contraction of visual fields which however is the result of toxic spasm of the arterioles produced by quinine. An optic neuritis has been attributed to blocking of retinal and choroidal vessels by parasites and leukocytes. Multiple hemorrhages are seen peripherally, and large macular hemorrhages may occur.

Other lesions are paralysis of the abducens, and ulcers of the cornea

with recurrent iritis and preceded by supraorbital neuralgia, the whole simulating herpes zoster. Heat, humidity, glare, loss of sleep, lack of proper nutrition, avitaminosis, and excessive use of tobacco result in toxic amblyopia. Among subjective symptoms the writer mentions weakness of accommodation and convergence, muscle imbalance, scotomata, sudden or gradual loss of vision (usually unilateral), headache, dizziness, and pain in the eyeball. Among subjective findings are noticed: irregularity of pupils, retinitis of atrophic type, generalized hyperemia of retina and disc, severe progressive retinochoroiditis and uveitis, and large scotomata surrounding and including the normal blind spot. M. Lombardo.

Wilder, R. M. **Nutrition and the human eye.** Sight-Saving Review, 1944, v. 14, no. 2, p. 75.

The acute severe process of nutritional deficiency quickly leads to abnormalities in the human body and is reflected in the eye by specific lesions. But chronic malnutrition or rather minor deviation due to unsatisfactory intake of one or another of the several essential nutrients may play an equally great part in the picture of poor health. Vigor and longevity, and what is called constitution and is generally attributed to chromosomal endowment, may be influenced for better or worse through the food ingested. Heredity may prove to be merely the inheritance of a good nutritional instinct. We may reasonably expect the application of nutritional knowledge to the maternal organism during pregnancy, and its continued application to the child, to prevent much of the type of disability which is commonly diagnosed as constitutional inferiority and attributed to poor heredity. Addition of milk to the children's diet in the British milk-school scheme has promoted better growth, better fitness, greater alertness, and bouyancy of spirit. A well-conducted study in an orphanage in Virginia proved the beneficial effect of added thiamine on learning.

Changes attributed to senility, for instance the colloid degeneration of the choroid, also often seen in younger persons, may be due to nutritional deficiency, as was pointed out by Yudkin. For senescence is a product of tissue damage. When a culture medium is regularly renewed, tissue cultures in vitro do not become senescent.

R. Grunfeld.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bahn, C. A. **Ophthalmic requirements of the military services.** Arch. of Ophth., 1945, v. 33, March, pp. 245-246.

This supplement, showing changes for the various branches of the armed forces, is to be added to previous articles by the author (See Amer. Jour. Ophth., 1942, v. 25, Nov., p. 1404; 1943, v. 26, Oct., p. 1129; 1944, v. 27, July, p. 797.)

R. W. Danielson.

Berens, Conrad. **The making of an ophthalmologist.** Jour. Amer. Med. Assoc., 1944, v. 126, Nov. 11, p. 671.

In guiding the student of ophthalmology, stress should first be laid upon excellence of education. The author believes 1½ to two years of general internship, stressing internal medicine, should be had before starting a residency of two to three years in a good eye hospital. Basic sciences should be emphasized. The ethics of the profession should be taught and followed. Better facilities and more encourage-

ment should be given the young man to indulge in research. The young ophthalmologist should join and participate in local and national eye societies.

Robert N. Shaffer.

Berkove, A. B. **Ophthalmologic statistics and experiences in a 1500-bed cantonment-type hospital.** The Military Surgeon, 1944, v. 95, Dec., p. 466.

Eighty-five per thousand patients examined were treated for acute or chronic external eye diseases. All but three of these were returned to active duty. No trachoma was encountered. Internal diseases of the eye occurred in a ratio of about twelve per thousand cases examined, many of which could not be improved with treatment. Of these, twenty were discharged because of progressive disabling eye disease. In the entire series only one case of glaucoma was seen.

In over 7,000 refractions 5,291 pairs of glasses were provided. Fifty percent of the men requiring glasses had compound corrections about equally divided between plus and minus types. The ratio of simple myopia to simple hyperopia is about 2 to 1 in soldiers with corrections above one diopter.

Owen C. Dickson.

Bonsib, R. S. **Ocular lesions due to industrial toxic compounds.** Sight-Saving Review, 1943, v. 13, no. 4, p. 257.

The growing use of poisonous chemicals in industry presents a serious hazard to the eyes of workers. A variety of dusts, vapors, and gases of mineral, vegetable, or animal origin give rise to miscellaneous disturbances. All reasonable efforts should be made to reduce hazards by installation of necessary facilities for the prevention and elimination of atmospheric contaminants, and by insisting on the constant use of protective goggles and masks.

R. Grunfeld.

Byrnes, V. A. **Evaluation of eye tests used in the examination of Army aviators.** Texas State Jour. Medicine, 1944, v. 40, Aug., pp. 235-240.

An attempt is made to point to a few of the visual tasks of the pilot of a bomber in combat. The four chief functions are acuity of vision, judgment of distance, efficiency of extraocular muscles, and color perception. The different functions and advantages of near and far vision are enumerated.

M. Lombardo.

Cameron, A. J. **Ophthalmic work in a British General Hospital in North Africa.** Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 26-36.

A detailed account of procedure in the examination and treatment of ocular battle casualties in a mobile hospital is given. A method of localization by injection of opaque dyes is being worked out for intraocular foreign bodies. Several cases of injury with various types of missile are reported.

The commonest type of conjunctivitis seen was a bulbar conjunctivitis with numerous small flame-shaped hemorrhages near the limbus. The best form of treatment was found to be painting the lids with silver nitrate. Repeated examination showed that staphylococcus albus was the organism usually present. The corneal ulcers were mostly of the multiple marginal type and responded well to vitamin and dietary adjuvants. The cases of trachoma were treated with sulfonamides by mouth and silver nitrate to the lids.

Edna M. Reynolds.

Carlisle, J. M. **Industrial first aid in chemical injuries of the eye.** Sight-Saving Review, 1943, v. 13, no. 4, p. 277.

All but the most trivial injuries should be seen by the ophthalmologist. The nurse, however, especially in a small industrial plant, should have standing orders. If a chemical irritant enters the eye it should be removed by irrigation with a copious amount of clean running water. The ophthalmologist should test the contents of the conjunctival sac with an alkaloid test paper. A local anesthetic must be applied. Cold lavage compresses changed every three to five minutes for a period of one to three hours are recommended, the irrigation to be continued until a neutral reaction is maintained upon testing the secretions in the fornices. The author further describes in detail the routine treatment prescribed for acid and alkali burns of the eyes following first aid.

R. Grunfeld.

Darley, W. G. **Improving the visibility of industrial tasks.** Sight-Saving Review, 1944, v. 14, no. 2, p. 102.

The author discusses the role of lighting in industrial efficiency. Deficiencies in lighting or seeing conditions in the factory include: insufficient brightness of the work due either to inadequate overhead illumination or to lack of needed close-up lighting (or the individual working in his own shadow); low brightness-contrast between critical detail and its background (contrast may be raised by altering the reflection factor, or by directional lighting); high disturbing brightness ratios between work and its surroundings, as when an artificial light source or a bright window is in the immediate field of view, or the work is brightly lighted and the rest of the room is dark. R. Grunfeld.

Da Silva, M. A. **Ophthalmology in Brazil.** Amer. Jour. Ophth., 1945, v. 28, April, pp. 398-400.

Davenport, R. C. **Ophthalmic education.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 210-217.

Undergraduate teaching should aim to teach the future medical practitioner to be an accurate observer of the external states of the eye, and to diagnose the commoner lesions. In sixty hours of clinical teaching the student should learn the differential diagnosis and treatment of the red eye, the implications of lowered visual acuity and of visual-field loss, and how to advise on a case of squint. He should watch a little operating to get an idea of the implications.

Postgraduate teaching should be given to two different classes, one containing nonteaching, nonoperating ophthalmologists and the other the teaching and operating ophthalmic surgeons. The last mentioned should have years of apprenticeship under the best of teachers, time and opportunity for research, for reading, for travel to clinics at home and abroad, and for work in associated branches of medicine. During two years of nonresident work they should do some teaching of younger colleagues, and act as demonstrator for the surgeon. Diplomas should be granted by a central ophthalmological body. The senior teaching staff should consist of professors and a whole-time dean or director of teaching, with a whole-time staff. Beulah Cushman.

Downing, A. H. **Ocular defects in sixty thousand selectees.** Arch. of Ophth., 1945, v. 33, Feb., pp. 137-143.

This paper consists of a tabulation and analysis of the visual defects en-

countered in the examination of 60,000 men appearing at a U. S. Army induction station. Both common and rare eye conditions are recorded to give some idea of their relative frequence. A total of 5,712 (9.5 percent) of the men examined were found to have eye defects. Strabismus was present in 2 percent. A total of 2,932 cases (4.9 percent) of monocular blindness or partial loss of visual acuity were found. Post-traumatic blindness was noted in 836 instances. Amblyopia was found in 1,920 cases, of which 855 cases did not have strabismus, 770 cases had convergent strabismus, and 295 cases had divergent strabismus. Amblyopia was responsible for 66 percent of all monocular poor vision. The author suggests that suitable preventative measures should be taken to lower the incidence of post-traumatic blindness, and that efforts should also be made toward early recognition and treatment of amblyopia. (5 tables.) John C. Long.

Foster, John. **A simple method of teaching medical ophthalmology.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 233-238.

Desiring to present a comprehensive picture of ophthalmology to medical students in a form easy to remember, the author analyzed the difficulties which defeat the undergraduate in his grasp of the subject. He requested the student to "think pictorially," and to reduce what he saw in the fundus to a few set terms as given on a chart. (One figure, 3 tables.) Beulah Cushman.

Gradle, H. S. **A visual service for small manufacturing plants aimed at the prevention of blindness by the elimination of industrial accidents.** Trans. Amer. Academy Ophth. and Otolaryng., 1944, 48th mtg., pp. 191-194. (See Amer. Jour. Ophth., 1944, v. 27, Nov., p. 1331.)

Greear, J. N., Jr. **Rehabilitation of the blinded soldier.** Trans. Amer. Acad. Ophth. and Otolaryng., 1944, 49th mtg., Sept.-Oct., pp. 59-62.

Since its opening as a military institution, the Old Farms Convalescent Hospital has treated 205 blinded enlisted men, of which 119 were under treatment in October, 1944. Many have injuries of other parts of the body. These men are trained to live as blinded persons in a seeing world. The first step is a satisfactory adjustment to the loss of vision, which is facilitated by an active program designed to make the patient personally independent as soon as possible. He is taught to shave, dress, and keep himself well groomed, to feed himself, to get around alone, and to care for his personal effects generally, keeping his bed and locker in order at all times. As he progresses, he learns to travel in a small town near by, and later in Philadelphia.

At the conclusion of this part of his training, there is considered the advisability of a furlough which permits a visit to friends and relatives in different parts of the country. Especially at this time, pity and maudlin sentimentality are to be avoided. Upon his return the soldier is placed on a full schedule which includes Braille, typewriting, physical education, and handicrafts. Among the latter are weaving, pottery, leather work, and plastic molding. The educational testing program through which the blinded soldier has also passed shows aptitudes that may direct future training. Better speech, with group discussions, is stressed, as are a varied social program and physical re-education. Bi-weekly progress-reports and frequent examinations

facilitate progress as far as the abilities of the patient will permit. Positions for those who are capable and so desire are secured in nearby plants.

When the soldier has proved that he is capable of carrying on in a seeing world, he is discharged and then handled by a representative of the Veterans Bureau who is familiar with placing the blind in industry and other phases of civilian life. Many of these blinded soldiers wish to continue their college education or to follow some profession. The large majority desire some mechanical job. If industry gives the blinded soldier a fair chance, he will not let industry down.

Charles A. Bahn.

Hearon, Eleanor. **Future goal for the prevention of blindness.** Sight-Saving Review, 1944, v. 14, no. 2, p. 94.

Advancement of medical science has caused a shifting of causes of blindness. The opportunity for prevention of blindness in the future lies in research into the causes of degenerative diseases. Periodic health examination should include a thorough eye examination, with a provocative test for glaucoma.

R. Grunfeld.

Kuhn, H. S. **Visual job analysis and prescribing for special work distances.** The Sight-Saving Review, 1943, v. 13, no. 4, p. 235.

The ophthalmologic consultant to an industrial plant should acquaint himself thoroughly with the specific mechanics involved in the plant. In this way he can assign each job-seeker to a working place commensurate with his visual capacity. The ophthalmologist has special problems of refraction to solve in regard to special lines of work, and near correction must sometimes be given even to young people, with careful attention to the pupillary distance. If a presbyope needs near vision on rare occasions only, he may do better with a flip-up correction. Electric-truck operators or crane operators should not be given bifocals. R. Grunfeld.

Law, F. W. **A faculty of ophthalmologists.** Brit. Med. Jour., 1945, Feb. 3, p. 160.

There is obvious need for an authoritative and representative body to guide ophthalmologists through the intricate and important problems which are to be settled in the near future, to represent their interests to the State, and to coördinate their efforts, so that in the coming reorientation of the medical service of the country the greatest good may accrue to the general populace, while at the same time the interests of the profession are protected.

The Council of British Ophthalmologists consists of the presidents and past presidents of the Ophthalmological Society of the United Kingdom, and the Section of Ophthalmology of the Royal Society of Medicine, together with nine other members. It was organized in 1918 to act in all matters of ophthalmic interest arising in connection with national industries and public services, and to initiate or advise concerning movements which have for their object the welfare of the eyesight of the community. It has recently been felt that this Council would have more weight and authority if it were more directly representative of the whole body of ophthalmologists in the country, and the Council of British Ophthalmologists has therefore decided to promote the formation of a Faculty of Ophthalmologists.

Specific functions of the Faculty are to encourage suitable standards of education and research, to secure the best

conditions of ophthalmic practice, to maintain high ethical standards, and to act as an authoritative body for consultation in public and professional matters of ophthalmic interest. Membership is to consist of ophthalmologists of full consultant status. Associates must have at least two years full-time special practice. Upon organization of the Faculty, which is now receiving applications, it will assume all the functions of the present Council of British Ophthalmologists.

Owen C. Dickson.

Livingston, P. C. **The Royal Air Force mobile eye surgery.** Jour. Royal Institute Public Health and Hygiene, 1944, v. 7, Dec., p. 319.

A six-wheel Fordson ambulance converted into an eye unit is described. In this small compact space are performed clinical examinations, the chief ophthalmic surgery expected in a war, supplying of corrective spectacles, and the study of nutritional diseases affecting the eye. The equipment includes a special Bjerrum screen to test the field of vision in complete darkness, and details of this test are supplied.

F. M. Crage.

Loewenstein, Arnold. **A central ophthalmological institute for the United Nations.** Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 6-12.

The plan is for a central institute of ophthalmology from which will issue perfectly trained clinicians, with the highest standards of scientific experience, and capable of undertaking the teaching of the medical schools of the United Nations. It is recommended that a new building, centrally located, be constructed along the lines of the newest eye hospitals in Russia or the United States.

A floor plan for an out-patient department is submitted and a schedule for staff meetings is outlined. The laboratory, library, and department of photography are described. The library should contain general medical literature of all nations as well as literature of the specialties. All of the staff should be on a full-time basis. (One diagram.)

Edna M. Reynolds.

Merewether, E. R. A. **The role of the ophthalmic surgeon in industrial health.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 357-359.

The author pleads that the ophthalmologist should take more interest in the causation of occupational affections of the eyes as to the following details: prevention and first aid treatment, examination of the visual state of the individual and his assignment to operations for which he is best suited, correction of errors of refraction and application of optical aids to certain difficult and fine work, standards of illumination, color vision, special nutritional factors, the relationship of eye defects to accidents, and education of the individual in use and care of the eyes.

Beulah Cushman.

Minton, Joseph. **Eye diseases in the East.** Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 19-26.

A description of the eye diseases of the native population as well as of those of the British and Indian troops stationed in Iraq, India, and Ceylon in 1941 and 1942 is given. Epidemics of infective ophthalmias occur regularly every year in Iraq, Palestine, and Egypt, beginning in May and lasting

until December. The patients, mostly children, develop severe mucopurulent conjunctivitis, which is usually associated with ulceration of the cornea. This conjunctivitis is caused by a variety of organisms—Koch-Weeks, staphylococcus, Morax-Axenfeld, gonococcus and bacillus diphtheriae.

Because of the high cost and shortage of the drug, only a very small proportion of the patients with gonococcic conjunctivitis received sulfonamides. The bulk of the patients were treated with argyrol, silver nitrate, and intramuscular milk injections. Sixty percent of the population in Iraq is trachomatous. Most of the patients were treated with silver nitrate, expression of the follicles, and copper. Sulfonamides were rarely used.

The British troops showed a very low incidence of infective eye conditions. There were no epidemics of conjunctivitis among them, and only a small number of isolated cases of mucopurulent conjunctivitis occurred. Some were associated with corneal ulceration. There were no cases of trachoma among the British troops. The Indian troops had a much higher incidence of mucopurulent conjunctivitis, associated with corneal ulceration of varying degrees of severity. A large number showed signs of old trachoma. There were no cases of gonococcic or diphtheric conjunctivitis among the British or Indian troops.

Keratomalacia is common among the children of the poor Hindus of Karachi and the surrounding country. Trachoma is also prevalent, but epidemics of gonococcic or diphtheric conjunctivitis are unknown. Epidemics of Koch-Weeks and staphylococcal conjunctivitis occur regularly every summer. In Ceylon trachoma is comparatively rare. Epidemics of mild Koch-Weeks infection occur with the onset of the monsoon in April. Throughout the summer there are large numbers of cases of infective punctate keratitis, which often cause central scarring of the cornea. Keratomalacia occurs among the very poor.

Among the 3,000 lepers on Ceylon, the chief manifestations of leprosy in the eye were lepromatous nodules on the conjunctiva and cornea. Most of the cases were complicated by iridocyclitis. Superficial and deep keratitis without nodules of the conjunctiva or cornea also occur, and blepharitis is very common among the lepers.

A sulfonamide paste was found useful in the treatment of mucopurulent conjunctivitis. Sulfonamides were found unsatisfactory in the treatment of epidemic punctate keratitis. Vitamin-B complex and riboflavin were found useful in this condition. (References.) Edna M. Reynolds.

Mumford, E. W. **Ophthalmological guidance for nurses in industry.** Sight-Saving Review, 1943, v. 13, no. 4, p. 282.

The ophthalmologist should guide the nurse in her work and determine the scope of eye services she is allowed to render. R. Grunfeld.

Murray, Michael. **An introduction to Bishop Berkeley's theory of vision.** Brit. Jour. Ophth., 1944, v. 28, Dec., pp. 600-611.

A brief sketch of Bishop Berkeley's life and a summary of his theory of vision are given. His belief that space perception is learned by experience and is not inherited or instinctive is questioned by the author. Numerous cases of congenital cataract successfully op-

erated upon are reported in which postoperatively the patients were able to detect a difference in the shape of objects although unable to name it. Experiments on the visual perception of rats and chickens are reported: they show an inborn judgment for distance. From these and other similar experiments the author assumes innate organization existing in man. The evidence is considered inconclusive and the problem undecided. (References.)

Edna M. Reynolds.

Parsons, John. **Ophthalmic education.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 208-209.

The author states that the teaching of ophthalmology to the undergraduate student should be confined to those portions of the subject which are essential to the general practitioner. Practitioners in ophthalmology may be divided into two classes: (1) The lower grade, which could be called "ophthalmic medical practitioners," consists of those medical men who engage in refraction work for County Councils and other bodies but do not undertake ophthalmic operations; (2) the higher grade consists of those post-graduates who propose to devote themselves to the practice of ophthalmic medicine and surgery and aspire to posts on the eye staffs of general and special hospitals. The latter grade should be open only to those who have followed a statutory course of instruction and who provide evidence of having obtained adequate experience. The curriculum for these students should include instruction on the general medical, neurologic, rhinologic, and other medical aspects of ophthalmology.

The examinations should be carried out by means of paper on optics, the physiology of vision, ophthalmic medicine and surgery, and ophthalmic pathology and bacteriology. There should be a clinical examination, a practical examination in ophthalmology and ophthalmic surgery, and oral examinations. A higher diploma should be available to these students from the Conjoint Board, or by a university degree.

Beulah Cushman.

Post, L. T. **The future of ophthalmology.** (Presidential address.) Trans. Amer. Acad. Ophth., and Otolaryng., 1944, 49th. mtg., Sept.-Oct., pp. 7-10.

Constructive planning for the future of ophthalmology is strongly advised. The public should have, and probably will have, the best of medical care at a cost within their means. Unless the medical profession does initiate the necessary measures to this end within a reasonable time, ill-advised governmental schemes will be foisted on both the medical profession and the public, to the detriment of both. Only by intelligent use of the trial and error method can the necessary adjustments be efficiently made. We must not repeat past blunders such as unwillingness to experiment with ideas simply because they do not originate within our profession. The medical and economic advantages first to the patient and then to the medical profession must be the criteria of future experiments. Based on the legitimate needs of today, there are too many major eye surgeons and too few refractionists. Educational facilities, both didactic and clinical, are needed to solve this and other problems which affect ophthalmic patients and the practitioners of tomorrow.

Charles A. Bahn.

Regan, J. J. **The goal of an eye-hygiene program for school children.** New England Jour. Med., 1944, v. 231, Oct.

5, pp. 486-490. (See Section 3, Physiologic optics, refraction, and color vision.)

Scott, J. G. **The eye of the West African Negro.** Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 12-19.

This report is based on examinations of 1,000 Gambian school children and 1,100 Gambian, 300 Gold-Coast, 300 Nigerian, and 300 Cameroon soldiers, in addition to hospital and clinic patients seen at a West-African military hospital over a period of 18 months.

Pigmentation of the interpalpebral conjunctiva and a ring of pigment around the limbus are normal. Vascularity of the cornea beyond the ring of pigment is pathologic and is most commonly due to trachoma. This is in marked contrast to European eyes, where normally 35 percent have vascularity at or beyond the limbus. Strands of persistent pupillary membrane are more common and more gross in Negro eyes than among Europeans.

The lens, vitreous, and fundus present no special points except the rarity of congenital lens changes. The Negro fundus is red in color, not chocolate or slate gray. The visual acuity of the Negro compares favorably with that of the European.

Two-percent homatropine and cocaine are not efficient mydriatics for Negro eyes. Two-percent cocaine with 5-percent homatropine gave a modest mydriasis. One-percent atropine produced in 20 to 30 minutes full mydriasis, lasting five to ten days.

The common ocular disturbances are of the corneal nebula, most frequently caused by onchocerciasis and trachoma, and iridocyclitis, caused by onchocerciasis and trypanosomiasis, as well as by more usual diseases. Microfilariae are not uncommon in the aqueous and are well tolerated. Many cases of onchocerciasis were found without palpable nodules, which suggests that the role of the nonencapsulated worm is important in producing the eye changes and that removal of nodules containing the adult Onchocerca volvulus is of doubtful value.

In contrast with Europeans, no case of chronic marginal blepharitis was seen, and only one case of phlyctenular conjunctivitis. Ophthalmia neonatorum is almost unknown in spite of the prevalence of gonorrhea. A few cases of follicular conjunctivitis and spring catarrh were treated. (References.)

Edna M. Reynolds.

Snell, A. C. **Responsibility of the ophthalmologist in the industrial field.** Sight-Saving Review, 1943, v. 13, no. 4, p. 223.

The numerous surveys that have been undertaken in the past reveal that about 20 percent of the workers have defective vision. Industrial ophthalmology has been neglected for want of sufficient number of ophthalmologists who would or could give adequate service, also through indifference of the employer and the employee alike. Neither of them was willing to assume all the cost for the examination of the eyes and for supplies, nor were the ophthalmologists ready to accept an adjusted compromise to bring their offices into the industrial plant. Another cause of neglect was ignorance on the side of the employers who did not know the importance of good vision in productive efficiency and in the prevention of both eye and other bodily accidents, and ignorance on the side of the employee who often was not aware of his visual defect and the possibility of its correction. The author stresses

a 13-point program to alleviate the existing condition. R. Grunfeld.

Sverdlick, José. **Ophthalmology in the medicine of Hippocrates.** Arch. de Oft. de Buenos Aires, 1943, v. 18, Feb., p. 103. (See Amer. Jour. Ophth., 1943, v. 26, March, p. 340.)

Townsend, J. G. **Importance of industrial ophthalmology.** Sight-Saving Review, 1943, v. 13, no. 4, p. 219.

Annual injury of 200,000 eyes bears out the importance of industrial ophthalmology. Seventy percent of the accidents occur on supposedly nonhazardous jobs. We must assume that protection of eyesight through the present safety programs is inadequate. Protective goggles are used widely but not so extensively as they should be, nor is the wearing of the goggles sufficiently enforced.

Protection against accident is only part of the ophthalmologist's job. Equally important are diagnosis of eye defects, job analysis, defining visual requirements. The ophthalmologist should familiarize himself with the numerous jobs within the plant and with the visual requirements of each of them. Just as it is important to keep out of a certain job a man whose vision, muscle balance, depth perception, or color discrimination is defective, so is it equally important to find for a man with these defects a job which he can adequately perform with safety to himself and to his fellowmen. Moreover, eye conditions are often symptomatic of systemic disorders, so that the ophthalmologist can render valuable service in coöperation with the rest of the medical staff. R. Grunfeld.

Weston, H. C. **Illumination and industrial efficiency.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 348-356.

Recent data suggest that the illumination required is inversely proportional to the third power of the apparent size of the detail to be seen. Roughly it seems that 6/6 vision is only good enough for sustained visual work of the ordinary grade, whereas for all "fine" and "very fine" work 6/5 to 6/3 vision appears desirable.

The standard of industrial efficiency can only be maximal when conditions are made ideal for the poorest worker. The extremes of range of illumination for workers may be in a ratio of 100:1. For example, with a typical group of persons doing fine work it was found that the average performance of the group as a whole only reached a certain level when the illumination was twenty times as much as necessary for the superior half of the group to attain the same level of performance. Doubling the illumination only adds 0.15 to the acuity, and still less with illumination over 50 foot candles. (5 diagrams, references.) Beulah Cushman.

Williams, R. C. **Industrial aspects of ophthalmology.** Sight-Saving Review, 1943, v. 13, no. 4, p. 231.

Workers with insufficient vision, formerly rejected, must now be employed in ever increasing number. The ophthalmologist must constantly confer with the management, the safety engineer, and the staff of the medical department for study of the working conditions of the employee, to institute proper safety measures, and to diagnose and treat eye conditions related to systemic diseases. He should assist in rehabilitation of those with sight defective from injury or other causes.

R. Grunfeld.

Wilson, Duncan. **Illumination in industry.** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 340-347.

The author reviews legislation pertaining to lighting matters from 1913 to the present. Improvement in lighting has been made possible by greatly diminished cost and the development of the rectifier type of photoelectric cell for the purpose of measuring illumination. Experimental work has proved that visual acuity improves up to 1200 foot-candles, provided the surrounding field is adequately illuminated and there is a linear relation between visual acuity and the logarithm of illumination for certain ranges of illumination. Further study has also revealed that variations in size exert a much greater effect on performance than corresponding variations in illumination.

Beulah Cushman.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Spear, F. G., and Tansley, K. **The action of neutrons on the developing rat retina.** Brit. Jour. Radiology, 1944, v. 17, Dec., p. 374.

Studies of the comparison of neutron activity (as obtained from the cyclotron) and gamma radiation were carried out on young rat retinas. In each experiment exposure to neutrons was followed by a reduction in the number of dividing cells. This initial diminution was succeeded by renewal of mitotic activity, and with doses above 5 n (1 n equals 2 to 2.5 r) this return was characterized by marked distortion of the phase ratio. In all experiments degenerate cells appeared between one and three hours after exposure to neutrons. Increase of dosage to 60 n showed considerably delayed recovery of mitosis, differing from that of gamma radiation, which usually shows a compensatory increase to supernormal levels.

Comparison reveals that neutron radiation has a more distinct lethal action on cells than does gamma radiation, although their effect on mitotic cells is relatively the same. It seems necessary to assume that the degenerate cell count is made up partly from a direct and partly from a delayed effect of neutrons upon cells.

Owen C. Dickson.

Vidal, F., and Malbrán, J. L. **Distribution of primary myelinated optic fibers in the pretectal area of the cat.** Arch. de Oft. de Buenos Aires, 1943, v. 18, March, p. 125.

Using 24 cats of different ages, retinal microlesions were produced in some of them and one or both eyes were enucleated in others. The animals were allowed to live for periods ranging from nine days to ten months. The material was studied with the Weil and Marchi staining method as modified by Swank and Davenport. The authors conclude that in the cat the primary optic fibers of the ventral and dorsolateral portions of the dorsal geniculate body run to the pretectal nucleus. No myelinated fibers originating in the retina end in the pulvinar of the thalamus or in the mesencephalic lentiform nucleus. No myelinated fiber of retinal origin is found in the superior colliculus. The same number of crossed and direct primary optic fibers run to the pretectal nucleus. The number of ventral fibers, however, is greater than the number of dorsal fibers. No fiber originating in the retina crosses the midline at the level of the posterior commissure. (Photomicrographs, bibliography.)

Plinio Montalván.

Vidal, F., and Malbrán, J. L. **Distribution of primary myelinated optic fibers in the dorsal geniculate body of the cat.** Arch. de Oft. de Buenos Aires, 1943, v. 18, Feb., p. 70.

In 24 cats of different ages one or both eyes were enucleated and the animals allowed to live for a period of time ranging from nine days to ten months. The specimens were studied with the Weil and Marchi staining method as modified by Swank and Davenport. The authors conclude that no myelinated fiber originating in the retina ends in the ventral geniculate body. The crossed and homolateral sensorial retinal fibers end in the ventral portion of the dorsal geniculate body. The number of crossed fibers in the ventral portion of the dorsal geniculate body is greater than the number of homolateral fibers. Most of the primary optic fibers end in the ventral portion of the dorsal geniculate body. Collateral fibers originating in the fibers of the optic tract and running to the pretectal region are observed in the ventral portion of the dorsal geniculate body. The dorsolateral fibers run to the pretectal zone, the homolateral fibers of the optic tract ending in the second and fourth layers and the crossed fibers in the first and third layers. No myelinated fibers of retinal origin end in the pregeniculate gray substance. (Photomicrographs, bibliography.) Plinio Montalván.

NEWS ITEMS

Edited by Dr. Donald J. Lyle
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

Deaths

Dr. Albert C. Cobb, Marion, Massachusetts, died March 21, 1945, aged 76 years.

Dr. Louis W. Flanders, Dover, New Hampshire, died January 16, 1945, aged 80 years.

Dr. John M. Foster, Denver, Colorado, died March 24, 1945, aged 84 years.

Dr. Edward R. Gookin, Washington, D.C., died March 6, 1945, aged 62 years.

Dr. George D. Hallett, New York, New York, died March 14, 1945, aged 78 years.

Dr. Samuel Hirschberg, Newark, New Jersey, died in April, 1945, aged 60 years.

Dr. Moses R. Kahn, Baltimore, Maryland, died January 11, 1945, aged 57 years.

Dr. Joseph L. Kershner, Effingham, Illinois, died March 13, 1945, aged 86 years.

Dr. Oscar L. Long, Portland, Maine, died March 9, 1945, aged 71 years.

Dr. Arthur M. MacWhinnie, Seattle, Washington, died February 28, 1945, aged 70 years.

Dr. Jason E. Montgomery, Weslaco, Texas, died January 30, 1945, aged 73 years.

Dr. Archie L. Oberdorfer, New York, New York, died March 12, 1945, aged 67 years.

Dr. Dorland Smith, Bridgeport, Connecticut, died February 5, 1945, aged 69 years.

Dr. Clarence S. Trimble, Emporia, Kansas, died March 16, 1945, aged 67 years.

Dr. Furman C. Whitaker, Bradenton, Florida, died March 8, 1945, aged 88 years.

Miscellaneous

The Council of British Ophthalmologists has sponsored the formation of a Faculty of Ophthalmologists, and the Council has now dissolved. The Council of the Faculty, consisting of regional and national representatives, was elected by ballot and at its first meeting on April 12, 1945, the following officers were elected: Brigadier Sir Stewart Duke-Elder, president; Mr. F. A. Juler, vice-president; Mr. Frank W. Law, honorable secretary; and Mr. F. A. Williamson-Noble, honorable treasurer.

The address of the Faculty is 45 Lincoln's Inn Fields, London, W.C. 2.

Society

The annual meeting of the Milwaukee Oto-Ophthalmic Society was held May 22d at the Milwaukee Athletic Club. The following officers were nominated for the ensuing year: Dr. Ralph T. Rank, president; Dr. Meyer Fox, vice-

president; Dr. Frank G. Treskow, secretary-treasurer; and Drs. Edwin Bach, Raymond Warner, and O. P. Schoofs, directors.

At the meeting of the Washington, D.C., Ophthalmological Society held on May 28th, the guest speaker was Dr. Ernest Sheppard, who presented a paper entitled "Infranuclear paralysis of the elevators; report of two cases illustrated by moving pictures." A demonstration of the "Berman locator" was given by Mr. Samuel Berman of New York City. The following cases were presented: "Hyalitis scintillans" by Dr. C. R. Naples; "Two cases of Duane's syndrome" by Dr. M. Noel Stow; "Pigmentary degeneration of the retina" by Dr. Ronald A. Cox; and "Traumatic section of cornea healed with the aid of a conjunctival flap" by Dr. Edward G. Cummings.

The officers of the newly formed Central Illinois Society of Ophthalmology and Otolaryngology are: Dr. Watson Gailey, president; Dr. Walter D. Stevenson and Dr. Stuart Broadwell, Jr., vice-presidents; and Dr. William F. Hubble, Jr., secretary-treasurer. The membership is limited to 50 and is open to members of the national board or those eligible to membership in it. The first meeting was held in Bloomington, April 21st-22d.

Dr. Antonio Torres Estrada has been elected permanent secretary of the Ophthalmological Society of the Hospital de Nuestra Señora de la Luz, Mexico City, to replace the late Dr. Rafael Silva. Other officers of this ophthalmological society are Dr. Manuel J. Icaza y Dublan, president; Dr. Jose Martinez Moreno, annual secretary; and Dr. Jose Luis Arce, treasurer. Dr. Torres Estrada is Director of the Ophthalmologic Hospital de Nuestra Señora de la Luz.

The Reading Eye, Ear, Nose, and Throat Society and the Reading Dental Society had a joint meeting May 16, 1945. Dr. Herbert K. Cooper, past president of the Pennsylvania State Dental Society, addressed the group. His topic was, "Cleft palate, and the correction of speech defects in crippled children."

Personals

Major Trygve Gundersen (MC), consultant in ophthalmology to the Mediterranean Theater of Operations, is now on temporary duty in the Ophthalmology Branch, Surgical Consultants Division, Office of the Surgeon General. For the past 27 months he has served as Ophthalmic Officer and Chief of the Eye, Ear, Nose, and Thorat service of the Sixth General Hospital, Mediterranean Theater of Operations.

Col. Derrick Vail (MC), Chief of the Ophthalmology Branch, Surgical Consultants Division, represented the Office of the Surgeon General at the recent Conference on Industrial Ophthalmology held in New York City under the sponsorship of the College of Physicians and Surgeons, Columbia University, in cooperation with the National Society for the Prevention of Blindness.

Dr. Frederick Andrews Kiehle has retired as professor and head of the department of ophthalmology after many years of distinguished service to the University of Oregon Medical School. Dr. Kiehle has been appointed professor emeritus and Dr. Kenneth C. Swan has been appointed professor and head of the department of ophthalmology.

PRESCRIPTION OPTICIANS